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Foot and Mouth Disease in California

The outbreak of foot-and-mouth disease, which made its appearance in California about February 20th, was considered under control February 29th. This is the view of Federal veterinarians of the Bureau of Animal Industry, United States Department of Agriculture, based on telegrams from its inspectors in the infected counties and on negative reports from surrounding territory.

The fine spirit with which the people of California received the rigid quarantine measures and their wholehearted co-operation in aiding federal and state inspectors to locate diseased animals are largely responsible for keeping the infection within the limited area of four counties.

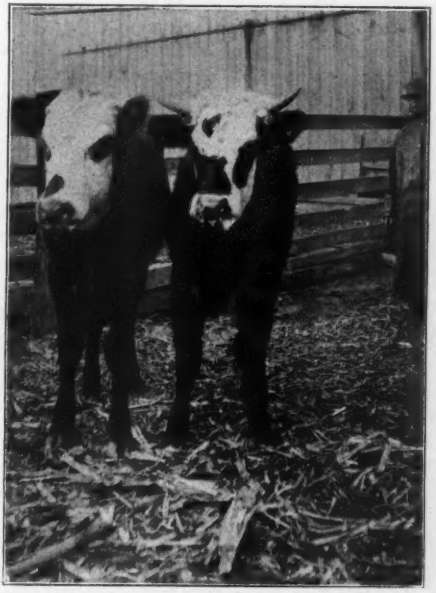
"The support of state and county officials, peace officers, and numerous organizations has been 100 per cent," declared Dr. John R. Mohler, Chief of the Bureau of Animal Industry; "Public-spirited stockmen and citizens are cooperating with the guards at boundaries of infected counties and the danger of foot-and-mouth disease spreading from within the area is now remote. It is still too early, however, to be certain that infection does not exist elsewhere."

Warnings Broadcasted by Radio

Livestock sanitary officials and government veterinary inspectors throughout the country, especially west of the Mississippi River, were advised at once regarding the sudden outbreak of foot-and-mouth disease in the vicinity of Oakland, California, just across the bay from San Francisco. In addition radio stations co-operated with the United States Department of Agriculture in broadcasting warnings and advising livestock owners to watch for symptoms of the disease and to report any suspicious cases to either state or federal officials. The warnings broadcasted included a description of the disease. In typical cases small blisters make their appearance on the mucous membranes of the mouth inside the cheeks, and inner surface of the lips. As the disease advances ropy saliva hangs from the mouth. Similar eruptions appear about the feet a few days later and there is a tenderness which may cause lameness. Animals lose their appetite and may refuse to eat at all.

Present Outbreak Described.

The cause of the outbreak is unknown, but infection is believed to have entered the country from abroad by way of the San Francisco Harbor. Suspicious symptoms were first observed by the herdsman of a dairy of 350 cattle near Oakland, Calif. He called in a local veterinarian who promptly reported the case to the county and state veterinarians, who in turn notified the inspector, representing the United States Bureau of Animal Industry in California. With the assistance of the veterinary department of the University of California at Berkeley, scientific tests were made of the lesions in the mouth, teats, and feet of the infected animals. Fifty per cent of the cows showed symptoms of disease and so acute



Typical Cases of Foot-and-Mouth Disease

was the infection that lameness developed very rapidly. One cow died on the third day. About the same time the disease appeared in a six-cow dairy, 25 miles away.

Prompt Action Taken By All Concerned.

Dr. C. M. Haring, Acting Director of the California Experiment Station, gave out the following information regarding the recent outbreak:

"The disease was first recognized by Dr. J. J. Hogarty, County Veterinarian of Alameda County, who consulted with Dr. J. Traum, Associate Professor of Veterinary Science at the University of California. At the request of state and federal officials, Dr. Traum inoculated calves, sheep, swine, horses and guinea pigs. The results were positive on all of these animals except the horse, the negative results in which further confirmed the suspicions of the state, federal and university veterinarians, since vesicular stomatitis, which is sometimes mistaken for foot-and-mouth disease, is easily transmitted to horses, whereas foot-and-mouth disease is rarely transmitted to these animals.

"One of the chief factors in the immediate suppression of the infection was the prompt cooperation of county and municipal police authorities, livestock men and livestock sanitary officials with the state and federal officials, and particularly the railroads which implicitly followed all requests of livestock sanitary officials although for several days these requests lacked legal force, since the governor of the state had not proclaimed official quarantine. The traffic police of the cities and counties immediately stopped all movements of livestock on the verbal request of Dr. J. P. Iverson, Chief of the Division of Animal Industry, State Department of Agriculture, and Dr. Rudolph Snyder, Inspector in Charge of the U. S. Bureau of Animal Industry.

"Some amusing incidents occurred in connection with the vigorous action of traffic police. For example, a bull being transferred by truck to the city of Oakland received a night's lodging in a garage, and considerable red tape had to be unwound before the bull could be removed from the garage.

"Measures were taken to compel owners to keep all cats, dogs and other pets confined. The pound masters of the bay cities were very helpful in enforcing regulations regarding these animals. This measure we consider very necessary since a number of family cows pastured in city lots in Richmond contracted the disease before it was officially known to exist."

Quarantine Established Immediately.

Within an hour after the United States Department of Agriculture had received evidence indicating foot-and-mouth disease, Secretary of Agriculture H. C. Wallace issued an order quarantining the counties of Alameda, Contra Costa, and Solano. The Governor of California, attorney general and other state and local officials immediately took steps to make the quarantine effective and stamp out the infection.

"All known infected herds under ground." This telegram, sent to the United States Department of Agriculture by its chief veterinary inspector in counties of California quarantined for foot-and-mouth disease, was received less than three weeks after the first report of the outbreak. The toll of the disease up to March 15th, as represented by animals destroyed and buried, was as follows:

Cattle	3,979
Swine	8,127
Goats	37
Sheep	11
Total	12,154

In addition to the figures given, several horses which had been driven out of the quarantined counties were reported unofficially to have been killed.

Guards Make Quarantine Tight.

Although livestock owners and public officials gave the veterinary inspectors whole-hearted cooperation, armed guards were stationed at the boundaries of the quarantine area to enforce an absolute quarantine.

"In addition to the federal quarantine which applies to nine counties," declared Dr. John R. Mohler, Chief of the Bureau of Animal Industry, United States Department of Agriculture, "the State of California has established very stringent supplementary quarantine measures. The regulations which were promulgated by G. H. Hecke, Director of Agriculture of the State of California, authorize officials and owners to destroy all stray animals and pigeons found on quarantined premises. All movements of livestock, poultry, and of all equipment off of or onto affected premises, is absolutely prohibited, except by officials of the State and Federal Departments of Agriculture. The movement of all feed and livestock out of closed quarantined areas is prohibited. The same restriction applies to manure. The manufacture of cheese in closed quarantined areas is prohibited, and the sale of milk and cream is surrounded with effective restrictions, dealing especially with pasteurization of products and sterilization of cans and equipment. Owners can not leave infected premises without changing their clothes and disinfecting their shoes."

Slaughter Policy Used.

As in previous outbreaks, the policy of slaughtering infected herds was immediately adopted, this being the only certain method of safeguarding the nation's eight billion dollar livestock industry from danger. The act making appropriations for the United States Department of Agriculture provides authority for "the eradication of foot-and-mouth and other contagious diseases of animals," and also gives authority for the destruction of infected animals. Suitable indemnity based on the meat, dairy, or breeding value is provided.

As a further precaution in controlling the disease, six additional counties in the vicinity of the outbreak were placed under quarantine. About this time also inspectors made preparations for slaughtering and burying the infected and exposed herds. On February 24th the digging of trenches to receive the carcasses of infected animals began and slaughter and deep burial followed promptly.

Other Precautions.

As a still further safeguard in suppressing foot-and-mouth disease, the Bureau of Animal Industry immediately notified its inspector in charge of the enforcement of the virus-serum law at Berkeley, Calif., to permit the use of no new stock and to prevent serum manufacturers from sending out any unsterilized product. All serums and viruses in the quarantined region are to be submitted to stringent purity tests.

Printing Office Lends Aid.

"One of the most valuable helps in combating the present outbreak of foot-and-mouth disease," Dr. Mohler declared in discussing the situation, "was the splendid co-operation from the Government Printing Office." The quarantine order which was signed by the Secretary late in the afternoon was printed the same night and delivered early the next morning. This made possible the prompt notification of railroads, other carriers, and livestock officials. In addition the huge presses at the Government Printing Office printed a special emergency edition of Farmers' Bulletin 666, "Foot-and-Mouth Disease," in one day. Other needed publications dealing with regulations and disinfectants were handled with similar dispatch.

Recommendations To Owners Of Animals.

The California Agricultural Experiment Station issued the following instructions to the owners of valuable herds throughout the state:

1. Keep out all visitors from the fields and livestock barns. Large signs that can be easily read should be posted at farm entrances and near the barns.

2. Employees should be forbidden to visit other livestock ranches or to handle outside animals.

3. No uncooked garbage should be fed to hogs on the premises.

4. No hay, grain, or other feed from the outside should be brought on to the ranch.

5. Insist that your creamery sterilize all milk cans on both the inside and outside and pasteurize all skim milk that is sent back to the farms.

6. No animals from outside should be allowed on the farms.

7. Stray dogs should be kept away from the fields and barns.

8. Herdsmen and others in charge of animals should be unusually alert to observe and report any indications of illness, particularly such symptons as lameness, salivation, or a sudden drop in milk flow in milking animals.

Mouth Lesions

9. Should the disease spread to nearby ranches, it is recommended that guards be stationed at a sufficient number of points of entrance to the farms to protect livestock against possible carriers.

Organization Of Control Forces.

The following organization of state and federal forces for control of the outbreak was authorized:

Investigation and Assignment Squad, having charge of all special investigations and assignments: Dr. G. A. Pfaffman, state; Dr. W. C. Herrold, federal; joint captains: Dr. L. Enos Day, federal, special diagnostician.

Police Squad, having charge of traffic and policing of premises and highways: Dr. C. E.

Mace, state, captain: Dr. T. B. Hamilton, federal, car tracer.

Killing and Trench Squad, having charge of destruction and disposal of all animals to be slaughtered on infected premises: Dr. Ewers, federal; Dr. John Dickson, federal; joint captains.

Appraisal Squad, having charge of valuation of animals to be slaughtered: Prof. W. Regan, state university; Dr. C. R. Behler, federal; joint captains.

Disinfection Squad, having charge of disinfection of all premises, railroad cars, etc.; Dr. Mariam Imes, federal, captain.

Permit Squad, having charge of issuing all permits: Dr. I. G. LaRue, state, captian.

Meat and Slaughter House Squad, having charge of all emergency regulations relating to meat and slaughter houses: Dr. G. Gordon, state; Dr. W. C. Herrold, federal, joint captains.

Dairy Products Plant Squad, having charge of all emergency regulations relating to dairy products plants and moving of dairy products: Mr. B. D. Mason, state, captain.

Property Squad, having charge of all purchases and finances: Mr. Holt, federal; Mr. H. W. Levers, state; joint captains.

Publicity Squad, having charge of accumulating all information and verifying or disqualifying, issuing a daily bulletin and all information for press and for the public: Dr. J. J. Frey, state, Director of Publicity; Mr. C. Lyman, publicity contact.

All state and federal men were assigned to one of the above groups, and in order to facilitate the work, exchange of men between group captains was permitted.

Foot and Mouth Disease Past and Present

The recent outbreak of foot-and-mouth disease in California is our seventh visitation of this most communicable of diseases of animals or man.

In the first three outbreaks, in 1870, in 1880 and in 1884, the disease was brought in by imported animals. The type of the disease was very mild in all three outbreaks, and this together with the restricted movement of livestock in those days, confined the disease to New York and Massachusetts in the first two instances and to Maine in the third outbreak. But few herds were infected and comparatively little difficulty encountered in eradication.

The outbreaks in 1902 and in 1908 were more grave. In both these instances the virus was brought to this country in certain biologic products. In the 1902 outbreak cases were found on 205 premises in twelve counties of four states. In 1908 the infection was located on 157 premises in twenty-three counties of four states. This outbreak was a far greater menace to the livestock interests than any of the preceding outbreaks, since it extended as far west as Michigan and thus came closer to the great stock raising region. In the 1902 outbreak 4,461 animals were slaughtered. In the 1908 outbreak 3,636 cattle, hogs, sheep and goats were slaughtered. The cost to the federal government in each outbreak was approximately $300,000. The cost to the various state governments was a little more than one-third of this amount in each case.

The 1914-15 Outbreak

The 1914-15 outbreak is fresh in the memory of most veterinarians. There was much unfortunate delay in diagnosing the disease and costly delay in establishing quarantines. Still more costly was the lack of co-operation of the public and the press with the livestock sanitary authorities in their efforts to combat the disease. Active opposition by some prominent livestock breeders and by dairy and breed associations all but stopped the employment of the only means that up until the present time offer the hope of success in the eradication of this disease—the radical slaughter method.

The extension of the disease to 3,556 premises in 226 counties in twenty-two states and the expenditure by the state and federal governments of $9,000,000 to encompass the eradication indicates the magnitude of the folly of the obstructionists.

Although the 1914-15 outbreak reached the great range country and even wild deer were affected, it occurred in only three states west of the Missouri, and there was no extension from the original foci in two of those states and but slight spread in the third; thus perhaps by a narrow margin did we escape numbering foot-and-mouth disease among the permanent indigenous diseases of livestock in America as a result of lay meddling with a scientific problem.

The $9,000,000 expenditure by the state and federal governments was a minor portion

of the cost of the outbreak, but the lesson was well learned. The methods of the federal Bureau of Animal Industry and the state veterinary departments were completely justified, and in the end much credit redounded to the veterinary profession for the achievement of eradication. Congress appropriated a million dollars for what was known as an insurance fund against future outbreaks; in time this fund was cut to half a million; still later to $50,000, and recently to $5000. Fortunate indeed was the fact, however, that Congress has from year to year ever since 1916 reappropriated $273,000, the unexpended portion of the deficiency appropriation for the 1914-15 outbreak, and this fund was immediately available for use in the present emergency and enabled the government to proceed to slaughter affected animals at once and to promise indemnity.

The whole history of foot-and-mouth disease in this country and elsewhere, as well as its remarkably easy transmission from animal to animal through numberless channels of distribution, is a warning that we cannot hope to entirely escape it. It is a near certainty that we shall continue to experience outbreaks from time to time. It is a positive certainty that each new outbreak will constitute a genuine emergency for the livestock industry—a menace which sanity dictates that we hold our machinery of control in constant readiness to meet and to overcome.

A Billion Dollar Justification for the Veterinary Profession

Accurate tuberculin tests in cattle have been made by other than veterinarians, and there are those who contend that tuberculin testing by lay testers with special training is practical. Veterinarians having discovered a means for the prevention of hog cholera and worked out the details of its use, there are those who stoutly maintain that county agents and graduates of "vaccination schools" and hog raisers of even less training can successfully handle an outbreak of hog cholera. We think, however, no intelligent, informed person would hazard an opinion that other than veterinarians can successfully cope with an outbreak of foot-and-mouth disease.

As foot-and-mouth disease is a calamity that constantly menaces the livestock industry it may be profitable at this time to examine the matter to see in some degree the magnitude of the disaster, against which the veterinary profession with six short lapses has so far been an effective protection, and thus fix some measure of its value to the livestock industry in the matter of this one disease.

Foot-and-mouth disease is the most communicable of known diseases. Its incidence rate in exposed animals is commonly 100%. It is not an exaggeration to say that unhindered we might expect 75% of the cloven hoofed animals in the country to be infected. Like other communicable diseases it runs in cycles. In Germany its cycles have occupied ten-year periods. If we may assume that in the year of its greatest prevalence 75% of the susceptible animals would be affected and during the year of greatest subsidence of the disease only 5% of the susceptible animals would be affected, we shall get an average for the ten-year period of 40%. Applying this measure to the 67,000,000 beef and dairy cattle in the

A Familiar Scene During the 1914 Outbreak

United States gives us an average annual infection of more than 26,000,000 cattle.

The average depreciation in value due to an attack of foot-and-mouth disease has been variously estimated and, of course, differs in different countries and in types of the disease of varying virulence. The mortality varies from 3% to 40%. There is a rapid loss in condition in fattened animals. There is a large diminution of the milk yield in dairy animals; garget is a common sequel of an attack in milk cows, and the permanent destruction of milk secretion in one or more quarters of the udder is frequent. An English veterinarian of wide experience estimates the loss in affected animals that recover to be $20.00 a head. If we accept this figure for the whole 26,000,000 affected and, for the sake of conservatism, disregard the 5% or more that die of the disease, the average annual loss in cattle alone would total the enormous sum of $520,000,000 or more than $50,000 for every veterinarian that America supports.

Were the loss in cattle less conservatively but probably more accurately estimated and the loss in hogs, sheep and goats taken into account, with some allowance for the interference with the meat and milk supply, the interference with public sales and fairs, with exportation of livestock and materials likely to carry infection and with interstate shipment, we may with reason say that uncontrolled foot-and-mouth disease would cost the United States a billion dollars a year. And the veterinary profession is the only effective insurance against this loss!

In the estimation of the public, it is that portion of the veterinary profession in the public employ that gets the lion's share of the credit for protecting the livestock industry from foot-and-mouth disease, and perhaps rightly so since it is the Bureau of Animal Industry that prevents the constant importation of the disease month after month and for years at a time, and it is the state veterinarians and their assistants who, together with the federal bureau, furnish the skill, experience and special qualifications necessary to formulate, direct and supervise the methods of combating the disease. But it should not be forgotten in any extensive outbreak, and the extensive outbreaks are the dangerous ones to

The Mopping-Up Squad. The coats of the inspectors are first washed with a strong antiseptic. Then the men stand over formaldehyd fumes which are allowed to go up under the coats and escape at the neck and wrists.

animal industry, the burden of eradication must fall chiefly upon veterinarians in general, since the numbers of the others are inadequate for handling more than a closely restricted outbreak. Furthermore, it is the practitioner who recognizes the disease in time to permit of its eradication in most cases with comparative ease.

If the disease were allowed to extend unrecognized until called to the attention of the public officials, probably all outbreaks would be extensive ones, and sooner or later some outbreak might very likely get beyond the point where control measures would be effective if it were allowed to spread unsuspected till chance brought it to the attention of the public officials.

The practitioner's share in the task of protecting our animal industry from this disease is a large one, and he should ever be alert to live up to this great responsibility. The public will accept no excuse from the veterinarian who sees but fails to recognize this disease. The action of the California authorities who sentenced to jail for six months the quack who first saw but did not recognize the latest appearance of this disease, is an indication of what the public attitude would be toward the qualified man who failed and who would not have the lack of training as an excuse for his failure.

The Cost of Foot-and-Mouth Disease

In the seventh outbreak of foot-and-mouth disease in this country, which occurred in California recently, so vigorous was the action of state and federal livestock authorities and so complete was the co-operation of the public in the infected territory that it was a matter of hours only from the time the disease was diagnosed until the three counties in which it then existed and to which it is still confined, were under a remarkably complete and efficient quarantine. Because of this instant action, the livestock industry and the public were doubtless saved many millions of dollars.

Spectacular as is the killing and burying of 12,000 animals as in this latest outbreak, or even of fifteen times that number as was the case in the last previous outbreak, it does not constitute the chief cost—scarcely even an important portion of the cost of an outbreak of this disease.

The immediate quarantine by Great Britain followed by a similar quarantine by Canada against all livestock, hay, grain and other materials susceptible to contamination from the United States, is said to have cost the country a million dollars a day; and at this date, nearly a month after the discovery of the disease, and when our own quarantine of the infected district has so far proved complete protection even to immediate surrounding territory, those quarantines are still enforced in Canada, 1000 miles away, and in England, six times that distance from the infected locality.

Costly as such quarantines are, the interruption of domestic trade and commerce is even more expensive. When there is an appearance of foot-and-mouth disease in any locality, agricultural commerce and trade in that locality, and usually in a far greater surrounding area, are paralyzed. Grain and hay must be held regardless of the market conditions, the requirements for storage or the needs of the owner. Fattened stock by the hundred thousand must be fed for weeks and often many months at a dead loss to the owner. Dairy products must be destroyed or only partly utilized. Public stockyards must sometimes be closed and the operation of packing plants suspended. A writer in a leading livestock paper estimated the loss to feeders of fat stock at 25 million dollars from delay in marketing occasioned by the 1914 outbreak of foot-and-mouth disease.

On the Firing Line to Protect the Cattle Industry

But however great is the cost of the measures necessary for the eradication of this disease, the submission to it supinely or through any halfway measure directed to its control, would incur a loss incalculably greater.

President's Address Before the Kansas Veterinary Medical Association*

By Dr. S. L. Stewart

The past twenty years mark the formative period of the veterinary profession in this state. The process of its development, like that of the other professions, has been evolutionary. It is still evolving. None of us will live to see it perfected. The fundamental requirements of all transformations of personality, society and of all organizations, depend upon the vision we now possess for the future. The future of our profession depends upon us now.

This association is the only mechanism we have to bring together the leaders of the profession in this state, to exchange experiences and formulate policies. It is my desire to see this association dominate veterinary policies and sanitary regulations within the state. That we have not accomplished this in the past, has been due largely to our lack of interest as a whole and the tendency to "let someone else do it."

The future of this organization and veterinary practice in this state will depend upon the combined efforts of its members and especially upon the leadership of those elected to conduct its affairs. Our leaders must be men, therefore, of broad vision, fair minded and full of determination—men who will demand right for the association and the veterinary profession of Kansas.

Educational Campaign Advocated

We owe many thanks to Dr. Dykstra and to all those who were influential in bringing about the construction of the new veterinary buildings. They are fine structures, of which every veterinarian should be proud. And we are proud of them and glad that we have a veterinary college in Kansas. But what of all this? Their value depends on whether or not they are attended and knowledge disseminated therefrom.

In an article in the November issue of VETERINARY MEDICINE, Dean Giltner of the veterinary department of the Michigan Agricultural College, in an open letter to the farm advisor, treats of the sad plight that has befallen the attendance at all veterinary colleges during and since the World War. It is astounding to know that there are people living in Kansas who do not know that the agricultural college at Manhattan has a veterinary department. It it no surprise to any veterinarian in the field of practice to hear someone talk in ignorance of the veterinary profession, its ability and achievements. These conditions could all be overcome by a proper educational campaign, and I would advise that an educational committee be appointed who are members of this association, one member of the faculty of the veterinary college and two members who are practitioners, for the express purpose of advertising veterinary science in the state of Kansas.

Regulation of Public Hatcheries

The association should at this time go on record as being in favor of some regulation controlling public hatcheries to prevent dissemination of white diarrhea in chicks. Kansas holds fifth place in poultry and egg production, and the producers of this great industry should have some protection against the ravages of this disease, as it can to a certain extent be controlled by serological tests and removing from the flocks hens that are carriers of the germs of the disease.

*Broadcasted via radio, Feb. 6, 1924.

Garbage fed hogs are not only subjected to digestive disorders due to putrefied and fermented foods but also to disorders incident to foreign bodies such as glass, nails, wire, needles, etc., that are frequently disposed of by the householder in the garbage. The passage of needles through the abdominal wall of garbage fed swine has been observed by Vandeworf.

"We bank on the cow, the sow, the ewe, and the hen."

The First National Bank of Petersburg, N. Dak., has this slogan on its unique bank statement recently issued.

Pictures of cows, sheep, and swine rather than moneybags are the decorations used. On the same page with a statement of the bank's financial condition is one of the agricultural status of the community.

Breeding Efficiency in Purebred Dairy and Beef Cattle*

By W. L. Boyd, University of Minnesota, University Farm, St. Paul, Minnesota.

The purebred cattle breeding industry occupies a very important position in relation to agriculture and represents an investment in cattle alone to say nothing of the capital invested in land, buildings, and equipment, of an enormous sum of money. There are many very serious problems confronting the breeder of purebred cattle, among which are selection in relation to type, conformation, production, and early maturity, also the perpetuation of breeds, character and families, and last but far from being least in importance, is the problem of breeding efficiency. When cattle fail to breed regularly or even occasionally, the breeder is rewarded with small returns and the expenditure of time, effort and money is high. Hence, any factor regardless of its source or nature which interferes with the breeding efficiency of a herd, is a serious menace to the cattle breeding industry. To be successful in the breeding of purebred cattle, requires the mating of healthy animals, in order to preserve fertility and in order that the newborn calf will be strong, active, vigorous, and ready to respond to growth stimuli.

The valuable purebred animal's worth is determined mainly by her ability to produce calves of equal value. When the organs of reproduction fail to function properly, her breeding can no longer be depended upon as a source of revenue, and the owner is forced to send her to the shambles for beef prices.

The Relation of Diet to Reproduction

The effect of diet on reproduction is a very interesting subject and considerable scientific evidence has been obtained from experiments conducted upon small animals.

Evans (1) has shown in his studies of reproduction in rats that by feeding a certain restricted diet, infertility will result, and that by the addition of other natural foodstuffs, their reproductive power will be restored. These findings apply to the male as well as the female.

Forbes (2) in his investigations with the mineral metabolism of the milch cow, has demonstrated that high producing cows during their lactation period, are as a rule, giving off in their milk more calcium and phosphorus, than they are ingesting in their food.

The work of Hart, McCollum, Steenbock and Humphrey, (3-4) has definitely proven that a diet restricted to the oat and wheat plant even if properly balanced, is not adequate for the nutrition of breeding cows, and brings about the expulsion from the uterus of a premature calf, which is frequently dead, or if alive, is weak and unthrifty. The results of experiments conducted with small animals, may not necessarily apply to the large animals, but they are very interesting as well as suggestive, and may later prove to be a solution of many of the problems met with in the various disorders of the reproductive organs of breeding cattle. Numerous cows of the various dairy breeds, which have been highly fed on a diet rich in protein necessary for the establishment of phenomenal records in milk and butter production, have at times suffered with serious disorders of the reproductive organs, resulting in temporary infertility, in certain cases, and in other animals permanent or incurable sterility, while other cows equally as highly fed, and with records of equal brilliance and importance, have not experienced these difficulties, and have continued to breed regularly.

The official testing of cows for the establishment of big records in milk and butterfat production, has no doubt been of great benefit to the various breeders and breed organizations; on the other hand as official testing is practiced by many of our breeders, it is no doubt responsible for decreased breeding efficiency. In the practice of feeding for high records, concentrates comprise the main part of the diet with small amounts of roughage. It is a known fact that concentrates are rich in protein and that they will stimulate milk production, and in as much as there is a close relationship between the mammary gland, and the reproductive organs, it would seem to be more than a mere possibility that some of the disorders of the ovaries and possibly the uterus may be accounted for in this way. It is the writer's opinion that there is among the breeders of dairy cattle, a growing impression that certain requirements for official testing.

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are detrimental to reproduction. It may be that the fault is not with the requirements of the different breed associations, but instead is with the individual who is responsible for the feeding of the animals. It may be that sometime though probably not in the near future, some of the requirements may become less rigid or so altered, that there will be a decrease in the number of cows becoming non-breeders following the termination of their test. The breeders of beef cattle do not have these same conditions to contend with, but they do have an important dietary problem to deal with in connection with the preparation of their animals for sale and show purposes, numerous females so prepared are known to be frequently affected with retarded conception or complete loss of fertility. A physical examination of many of these cases, frequently fails to reveal pathologic or congenital defects which will explain their inability to conceive.

Livestock breeders in general throughout the United States, are interested in the subject of mineral feeding, and many of them are at the present time feeding minerals of different kinds and sources in the attempt to make the breeding of livestock a more lucrative business. The lack of vitamins and certain minerals in the various feeds, may bear a close relationship to certain forms of sterility, but more extensive and exhaustive research will be necessary, before these important and now every day questions, can be satisfactorily answered. The percentage of sterility in cattle as a result of errors in diet, lack of exercise, congenital defects together with specific infectious diseases, such as tuberculosis and actinomycosis, cannot be correctly estimated. However, they must be taken into consideration as important factors in the successful breeding of cattle.

In a recent article on tuberculosis, Professor Bernard Bang of Denmark, states that "tuberculosis of the uterus, probably occurs twice as frequently as it does in the udder." This statement would not in all probability apply to the cattle of America and judging from our experience in the northwest, infertility or failure to breed as a result of uterine tuberculosis, is indeed a rare occurrence in this part of the United States.

Bovine Infectious Abortion—The Most Important Problem in Relation to Breeding Efficiency

A large percentage of the diseases of the reproductive apparatus which prevent or retard conception in breeding animals, is in the main due to the invasion of the various organs by certain microorganisms. Of these, Bacterium abortus Bang is by far the most important. This bacterium is a frequent invader of the gravid uterus, as well as the fetus and portions of the fetal envelopes. Placentitis, frequently associated with infiltration and edema of the chorion, constitutes one of the common symptoms of uterine infection. That this infection is caused largely by the invasion of bacterium abortus, is evident from the fact that retention of the fetal membranes is a common symptom in herds, where abortion disease is known to exist, and in which the causative factor has been determined clinically, bacteriologically and by the application of the well known serological tests. Bovine infectious abortion which is caused by the Bang organism, is a widespread infection in cattle, and is a serious menace to the cattle breeding industry. Not only does the breeder suffer large financial losses from calves born either dead or prematurely, but from decreased breeding efficiency, resulting from the effect of temporary or permanent sterility in many of the infected animals.

Bacterium abortus is probably not directly responsible for many of the pathologic changes occurring in sterility, yet it frequently paves the way or makes possible the entrance of other organisms, which under certain conditions find a suitable field for growth and multiplication, resulting in either temporary or permanent loss of fertility. Pyogenic bacteria, namely streptococci, staphylococci, bacillus pyogenes, and members of the colon group, are the ones most often encountered. Uterine infections which are not caused by Bacterium abortus and are characterized by the act of abortion as well as retention of the fetal membranes, with subsequent sterility in a large number of the animals, are known to occur. The results of the serological tests show however, that a very large percentage of the abortions occurring in different sections of our country, are the result of the activities of Bacterium abortus. The successful control or eradication of the disease produced by this organism would be of untold value to the breeders of purebred cattle.

Retention of the Fetal Membranes As A Factor in Breeding Efficiency

Retention of the fetal membranes is recognized as the most common symptom of uterine infection. The arrangement of the placenta in the bovine and ovine is more complex than in other domestic animals, and in the

cow consists of from seventy to one hundred vascular cotyledons (fetal) scattered over the envelopes enclosing the fetus and directly attached to the same number of cotyledons (maternal) on the mucous membrane of the uterus of the mother. This is known as a polycotyledonary placenta. The fetal cotyledons or chorionic tufts, consist largely of capillaries which are lined with a single layer of epithelial cells. These tufts fit into the depressions or crypts on the surface of the cotyledons. The cotyledonary crypts are lined also with a single layer of epithelial cells. These areas of attachment or cotyledonary interdigitation, consitute in the bovine, the only paths for the interchange of nutrition and waste material. The blood vessels of the fetus and those of the mother, are in close apposition but are not continuous, being separated by the above described layers of epithelial cells.

The fetal membranes perform a highly important function during the manufacturing process of the fetus, but immediately following parturition their function ceases and they become a mass of dead tissue, which if not promptly expelled or removed, may result in temporary or permanent failure to again successfully reproduce and occasionally in loss of life.

The separation of the fetal and maternal cotyledons is the result of cessation of the fetal

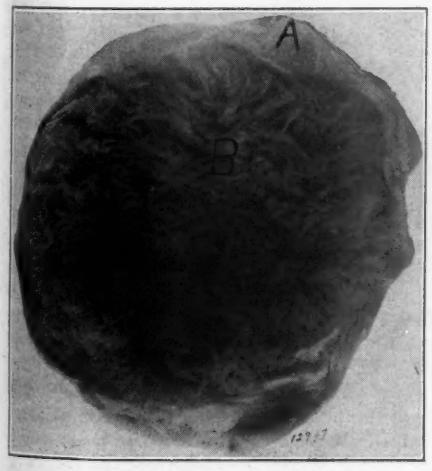

Fig. 1. Normal Fetal Cotyledon. A. Chorion. B. Chorionic villi.

circulation, which permits the falling away of the chorionic villi from the crypts of the cotyledons. The expulsion of the membranes is effected by their weight and the muscular contractions of the uterus. The fetal placentae of the bovine do not separate from the uterus simultaneously, but one after the other. The fetal membranes are as a rule expelled within

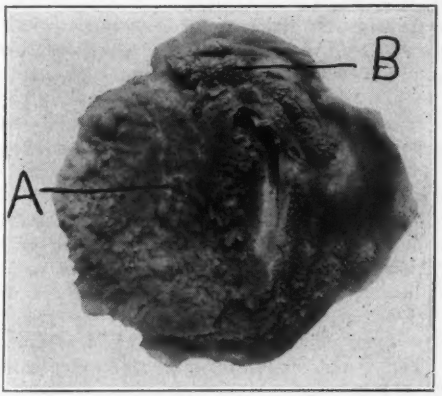

Fig. 2. Fetal Cotyledon. A. Normal chorionic villi. B. Areas of necrosis. Frequently observed in bovine infectious abortion.

four to six hours following parturition. In a certain percentage of cases, they will be expelled in two or three hours, and not infrequently they will remain attached for a period of nine or ten hours, even though inflammation of the placenta is absent. When the fetal membranes are retained for more than ten or twelve hours, it is quite evident that placentitis is present, and that they will have to be removed manually or allowed to remain within the uterus to undergo the process of putrefaction, being finally expelled as a putrid malodorous mass, consisting mainly of fluid, pieces of the membranes and tissue debris. In experimental animals immediately following parturition we have upon numerous occasions, experienced great difficulty in securing a sufficient number of placental attachments for bacteriologic and pathologic study, yet the entire fetal membranes of these animals, were frequently expelled four or five hours later. Severe hemorrhages in normal separation of the fetal membranes are only rarely observed in the large animals. The investigations of Theobald Smith (5) have shown that Bacterium abortus Bang has a predilection for the chorionic epithelium. In this specific infectious disease, these cells either individually or in series are densely filled with minute bacilli. The bacilli do not lie on the cell or in the ectoplasm, but fill the cell body entirely. When the

focus is changed, the cytoplasm appears filled in all optical sections. It is a well established fact that retention of the fetal membranes is a common forerunner of sterility. The successful control or eradication of bovine infectious abortion would mean a greatly reduced percentage of retained fetal membranes, which would result in increased breeding efficiency, a condition which would be of untold value to the breeders of purebred cattle.

Inflammation of the placenta, if at all extensive, means retention of the fetal envelopes, which act invites sepsis and results in retarding or stopping involution. Involution acts as a barrier to infection, and it is a well established fact that the uterus supplied with normal muscle tone, and which undergoes rapid reduction, does not often absorb bacteria or their toxins.

The Symptoms of Retained Fetal Membranes

The symptoms of retained placenta are as a rule not difficult of recognition, although certain cases especially those in which none of the membranes protrude beyond the vagina, may escape early detection. Immediately following parturition, regardless as to whether the act of birth is normal or abnormal, portions of the fetal membranes will be seen protruding beyond the vulva. However, one must not in establishing a diagnosis, attach too much significance to this observation. In a certain percentage of cows in which placentitis is well advanced, uterine inertia will have developed to the point that parturition has been retarded or delayed. The muscle tone of the uterus is lacking, the walls are flaccid and there is no tendency toward involution, and if the placenta at the cervical region has separated, the fetal membranes will not infrequently drop back into the uterus. Especially is this true if the placenta at the ovarian end is adherent. Decomposition of retained fetal membranes brought about by the rapid invasion of the uterine cavity by streptococci, Bacillus pyogenes and anaerobic bacilli, usually occurs within forty-eight to seventy-two hours. Putrefaction is evidenced by the presence of a reddish-brown malodorous discharge, containing shreds of the membranes, occasionally sloughed off cotyledons and tissue debris. Strong vigorous cows may undergo this ordeal until the entire mass has been expelled, while numerous cows will suffer partial or complete anorexia, elevation of temperature, decreased lactation, mastitis and enteritis, which is in many instances accompanied by a copious watery diarrhea of a fetid odor. Severe metritis and metroperitonitis frequently develop. Pelvic adhesions are extensive and massive, and abscess formation is not uncommon. The mortality rate is low, but occasionally death results from gangrenous metritis, septicemia or terminal pneumonia. Pyometra is not an uncommon sequel of retained afterbirth.

Treatment

Retention of the fetal membranes is a serious pathologic condition and demands the most skillful and careful handling in order to obtain satisfactory results. In retention of the afterbirth, it is difficult to draw a sharp line of demarcation between physiologic and pathologic processes. In other words it is difficult to say where physiology ceases and pathology begins.

In our investigations of the various changes occurring in the reproductive organs following parturition, we have observed the following conditions: Healthy cows undergoing parturition will frequently expel their fetal membranes, within two to three hours, while others will require five or six hours time before the membranes come away. When they are retained for more than a period of ten hours, one is as a rule safe in considering the condition as pathologic. In cows suffering with abortion disease, as previously stated, retention of the fetal membranes is a common symptom. When expulsion of the fetus occurs in the early stages of gestation, the fetal envelopes very often escape with the fetus. They may however, be retained as early as at ten or twelve weeks of pregnancy. They do not at this stage often protrude beyond the vulva, but they will be found extending through the cervical canal into the vagina. A very large percentage of abortions occur after the fifth month of pregnancy, when the placental attachments are more highly developed, and the process of inflammation more advanced. From a compilation of 915 cases by the German Imperial Health Office, over 85 percent of the cows were in the sixth or later months of pregnancy.

The treatment of retained placenta should be attempted only by the veterinarian, although in many sections of the country, treatment is performed by the herdsman and owners, who do not confine their activities to scrub and grade cows, but treat purebred cows as well. The veterinarian for various reasons, is partly responsible for this condition. One of the chief reasons is the neglect or failure to educate the farmer and breeder of the gravity and

importance of this most serious condition. A second reason is the general practice of manually removing the afterbirth whether or not it is in a condition suitable for removal. This sort of practice has in many instances placed manual removal in great disrepute. During the past decade, more attention has been given toward the education of breeders of cattle; the result is that numerous herdsmen and owners now recognize the seriousness of this condition, and are anxious to follow the suggestions of the attending veterinarian in order to minimize the loss of fertility, which is sure to follow in the wake of this serious malady. A study of the literature shows that there is among veterinarians, a wide difference of opinion as to what consitutes the proper method of treatment of this very common condition. This state of affairs is not confined to the veterinarians of this country, but exists also among the veterinarians in foreign countries, especially where cattle breeding is an important and extensive industry. In 1918 Albrechtsen stated that the best treatment for retained placenta is still a question for discussion among the veterinarians of his country. He further stated that the most rational treatment, the one that leads to most prompt and complete recovery in the large majority of cases, is removal of the placenta, when this is carried out with due consideration for individual cases. The removal to be preferably done during the first day when the operation is performed on a fresh or slightly changed cow, and at a time when the uterus has undergone slight contraction. He does not advocate this treatment for those cases in which the placenta is firmly adherent, but advises that the operator wait until they can be taken away with slight traction, after which the uterus should be thoroughly irrigated with a large amount of warm physiological salt solution. In a recent publication on the treatment of retained placenta, Grim (6) of New Jersey reports the results of a number of different methods of treatment as carried out in a large herd of dairy cattle. His studies show very conclusively that the best results were obtained where the placenta was removed by hand within twenty-four to thirty-six hours, following parturition. Those cases in which there was little or no tendency toward separation, were allowed to remain until the third or fourth day. Grim was able to remove the membranes within thirty-six hours, in twenty-six out of thirty-five cases. The time required for removal was not more than thirty to forty-five minutes in any case. No disinfectants or solutions of any kind were used for irrigating the uterus after the membranes had been removed, except four cases in which the discharge persisted. These were treated later with Lugol's solution.

Artificial methods of treatment of retained afterbirth are varied and numerous. The use of eight ounces of peroxid of hydrogen in two quarts of water, is recommended by some men as being helpful in retarding putrefaction and hastening separation. The employment of uterine capsules containing various ingredients, has gained great popularity during the past few years. Many practitioners regard this form of treatment as highly satisfactory when used either alone or as an adjunct to manual removal. Others have discarded the use of capsules and are substituting mineral oil, either alone or combined with antiseptics, such as boracic acid or iodoform or both. After removal of the placenta either by hand or following its expulsion from the effect of putrefactive changes, many veterinarians are practicing uterine irrigation, using either saline solutions or Lugol's or other mild antiseptics, such as acriflavine, therapogen, chlorazine and numerous other agents. Very few men are now using coal tar products such as lysol or creolin, as it has been well demonstrated that these agents are far from being satisfactory for irrigating the genitalia of the cow. In 1917 R. R. Shaw (7) described a rather novel form

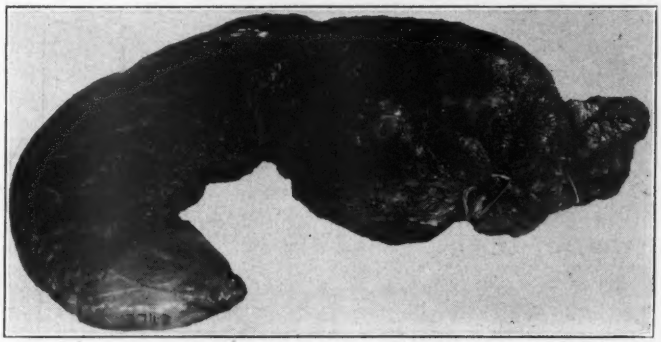

Fig. 3. Fetal Sac Showing Extensive Necrosis of the Chorion

of treatment, which consisted of injecting a normal salt solution into the ends of ruptured blood vessels. He reported on three cases. This form of treatment has never become popular. Probably the chief reason for the limited application of this method is due to the pathologic condition in placentitis. The plugging of the vessels with thrombi, make the passage of fluid a very difficult one. Within the past year, the use of animal charcoal contained in gelatine capsules, has received prominent mention. This form of treatment originated from the investigational work conducted by Oppermann (8) of the Veterinary School of Hanover, Germany. In connection with this form of treatment, it is important that there should be no douching of the uterus either before or after the introduction of the capsules. If irrigation is performed, the action of the oxygen will be diminished and the result less effectual.

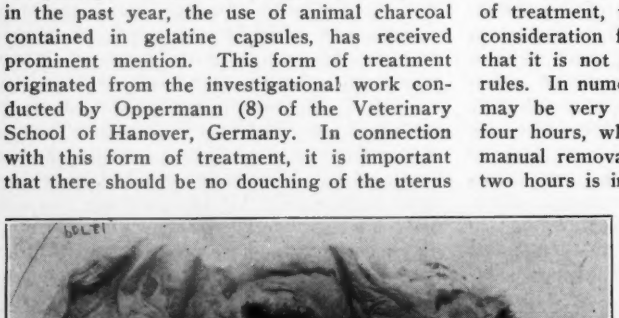

Fig. 4. Extensive Placentitis. A. Placental attachment only slightly modified. Inflammatory changes are present at the periphery being manifested mainly by adhesions between fetal and maternal cotyledons.
B. Fetal cotyledon in which the villi have been destroyed.
C. Areas of necrosis in the intercotyledonary spaces.
D. Chorion showing thickening as a result of edema and infiltration with the products of inflammation.

Extracts of the pituitary body have been recommended as being of considerable value in the treatment of retained afterbirth. It is a known fact that this extract stimulates contraction of all unstriped muscle, regardless of its innervation. The use of this biologic agent, is indicated only shortly after parturition. This requirement makes it difficult to determine its real value. The fact that it must be administered immediately or shortly after parturition, renders it of little value to the practicing veterinarian. We have used pituitary extracts in our work with more or less indefinite results. We are of the same opinion as expressed by Albrechtsen in that manual removal constitutes the most satisfactory method of treatment, when it is performed with due consideration for individual cases. We know that it is not safe to follow any set or fixed rules. In numerous cases, the fetal membranes may be very easily removed within twenty-four hours, while in other animals successful manual removal within forty-eight to seventy-two hours is impossible, and in a certain percentage of cases, manual removal is beyond question, until complete separation has resulted from the process of putrefaction, at which time they may be removed by irrigation, together with the application of rectal massage. Manual removal of the fetal membranes should be attempted when the placenta can be detached without resulting in irritation, pain or hemorrhage, the symptoms of which consist of straining, the escape of blood and frequent defecation. In those cases where necrosis is extensive, with sloughing of the cotyledons and thickening of the chorion, the membranes and tissue debris should be manually removed.

The manual removal of all of the fetal membranes from cows which have aborted late in gestation or from cows which have given birth to strong healthy calves at the termination of the normal gestation period, is usually impossible, and when the operator spends one hour or more in the effort to remove these tissues, more harm than good is accomplished. Because of this sort of practice, many of the cattle breeders of this country, have very decided adverse opinions, relative to the value of manual removal as a satisfactory treatment for retention of the placenta. Time will not permit of describing the manner of technic employed in manual removal, other than the

statement that it can be much more easily described than performed. Many cases when first observed, present such a filthy appearance and condition, that manual removal is anything but inviting. But once the exterior of the genitalia is thoroughly cleansed, and the patient is placed in a clean dry stall, conditions become far more encouraging. Successful irrigation of the uterine cavity with the fetal membranes attached, is impossible, the fetal sac will receive the irrigating fluids, which in many instances become difficult of removal on account of portions of the membranes being drawn into the fenestra of the catheter in the siphoning process. Much good can be derived by irrigation if one is careful in the selection of his cases. Large quantities of exudate, may in this way be removed and putrefaction is held in abeyance. If on the other hand, the walls of the uterus are more or less flaccid and void of muscle tone, irrigation is dangerous and should not be attempted. The fluids injected into these cases cannot be siphoned off successfully, and they not only add weight to the already weakened organ, but aid in making conditions more favorable for bacterial development. We use in many of our cases, mineral oil, lard or vaseline, or antiseptics contained in capsules, in the attempt to allay irritation and to discourage putrefactive changes. The cow with retained fetal membranes should be isolated and should receive careful consideration until she is ready to be returned to the herd. In those cases where manual removal of the fetal membranes is deemed inadvisable, we recommend clipping off the membranes close up to the vulva, in order to prevent, if possible, infection of the udder and intestinal disorders of the new-born. One should be careful to leave enough protruding in order that the cervical canal will remain open.

In the treatment of retained placenta, we should at all times remember that we are confronted with the condition of metritis, the course of which we endeavor to modify or check. The removal of the fetal membranes while of great value, does not terminate the inflammatory process. The after treatment is very essential if we expect to minimize decreased breeding efficiency, which frequently results. Uterine douching with mild antiseptics or saline solutions, together with the gentle application of rectal massage, is of wonderful value in hastening the retarded involution and in preventing the development of certain chronic inflammatory conditions, which if not recognized early, and proper treatment instituted, will often produce incurable sterility.

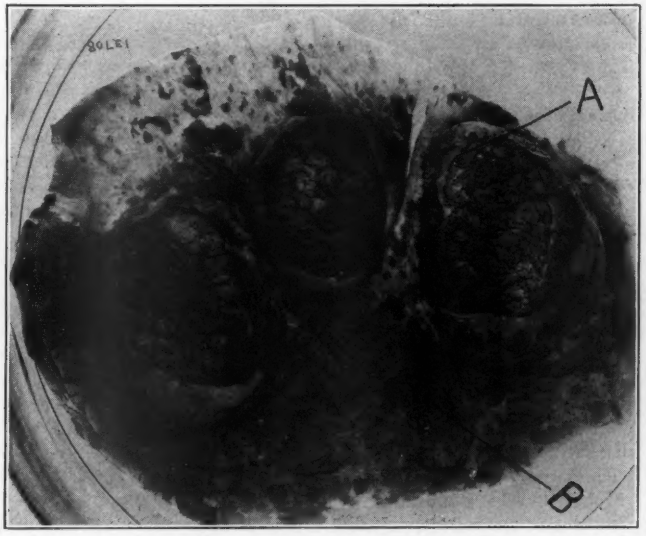

Fig. 5. Placentitis with marked necrosis.
A. Fetal placenta with imprisoned portions of the maternal cotyledons which have become separated as a result of necrosis.
B. Chorion much thickened and necrotic.

I wish also to mention the use of general stimulants and tonics in those cases in which there is inappetence and weakness, and the employment of liberal doses of intestinal antiseptics, if they can so be considered, such as creolin (Pearson), mucoseptone, therapogen, etc., in cases where diarrhea develops as a result of absorption of toxins liberated in the uterine cavity. Educational work with the breeder, should be continued until he thoroughly appreciates the serious nature of retained fetal membranes. He should be warned that not only the milk production of his herd is greatly lowered, but that the future breed-

ing efficiency of his animals is markedly reduced, which brings about severe economic losses, and tends to make cattle breeding and dairying a hazardous business enterprise.

The Relation of the Corpus Luteum to Breeding Efficiency

The corpus luteum is a ductless gland of internal secretion, and originates in the ovary following the discharge of the ovum. This gland when functioning normally, is of little or no interest to the practical breeder of cattle, but when it ceases to be physiologic and becomes pathologic, it is then an important factor in breeding efficiency.

The breeder of livestock considers as the chief symptom of early pregnancy, the cessation of estrum. While this is constant and reliable in the very large percentage of cases, it does not always prove fertilization has taken place. The corpus luteum of estrum is renewed every twenty-one days, but under certain unexplainable conditions, it will occasionally fail to be absorbed, and remains in the ovary for an indefinite period of time, causing cessation of estrum by mechanical blocking and through some form of internal secretion. Cases of this kind exist in every herd, and unless there are regular examinations made of the reproductive organs, the animal will be looked upon as being in calf, passing by several weeks or months without showing signs of estrum, when suddenly estrum will reappear, thereby producing disappointment and discouragement to the owner who suffers financial loss on account of retarded fertility. The corpus luteum of pregnancy, remains throughout the gestation period and usually does not entirely disappear until thirty or forty days following calving, at which time the estrous cycle is re-established. The corpus luteum of pregnancy is responsible for maintaining the raised nutrition of the uterus during the manufacturing process of the fetus, and it also is thought to have something to do in the development of the mammary gland and in the continued existence of the fetus in the uterus, during the early period of pregnancy.

If the corpus luteum after the termination of gestation fails to degenerate, it continues to function and inhibits estrum, with the result that there is a delay in breeding, which may be of short or long duration. This kind of a structure is known as a persistent corpus luteum, and it remains in the ovary for indefinite periods of time. All cows affected with persistent corpora lutea are not affected with absence of estrum, and not all cows in which estrum is absent, though they may not be pregnant, are affected with a persistent corpus luteum. The removal of the corpus luteum, provided that all of the other organs are free of pathological changes, is as a rule, followed by the well known signs of estrum within three to five days, and if bred at this time, the cow will very frequently conceive. The corpus luteum is an important factor in connection with the breeding efficiency of cattle, and veterinarians can by the proper manipulation of this gland, establish estrum, with marked regularity. The corpus luteum also bears a close relationship to some of the various disorders of the reproductive organs.

Cystic changes are among the most frequently encountered disorders of the ovaries. This condition may originate from the corpus luteum which gland very often undergoes cystic changes. In the majority of the cases of pyometra, there is present a retained corpus luteum, which may be projecting above the surface of the ovary or may be deeply imbedded. The removal of this gland, will in the large percentage of cases be followed by marked improvement. The corpus luteum also affords in the hands of the veterinarian, a powerful weapon for the production of mechanical abortion, indicated in those animals that have been bred too young, or which have been accidentally bred to sires of different breed or to scrub sires. There are certain pitfalls in connection with the removal of the corpus luteum and great care should not only be exercised in its removal, but also in determining whether it should or should not be removed. Proper handling of the corpus luteum is a valuable asset to the veterinarian for increasing the breeding efficiency of cattle.

Some Interesting Facts Observed in the Study of the Relation of the Corpus Luteum to Estrum

Of the twenty cows studied, three, or 15% failed to exhibit the well known signs of estrum after removal of the corpus luteum. Later examinations revealed the fact that these animals had ovulated, which was evidenced by the presence of newly formed corpora lutea.

The removal of the corpus luteum is not always followed by the symptoms of estrum, even though ovulation is re-established. This phenomenon is apparently influenced by cold weather. In one of our cows, cow No. 20, severe inflammation of the ovary with extensive adhesions, developed following the removal of the corpus luteum.

Infective agents were in all probability lurk-

ing within the oviduct or in near vicinity of the ovary, which, when damaged by pressure necessary in the removal of the yellow body, found the injured tissues a favorable medium for their propagation. It will be noted that this animal later bred successfully.

In another large herd there were fourteen cows, none of which were in calf, but in each animal there was an absence of estrum. Each cow was found to have present a persistent corpus luteum. The corpora lutea were removed, and all but one of the animals exhibited the well known signs of estrum within seven days. The one which failed to come in heat was suffering with metritis and possibly infection of the ovary, which when operated on, became more severe. Some cows in which the corpus luteum is removed in order to restore estrum, do not always show the well marked symptoms of heat and consequently are not bred, but subsequent examinations will in almost every case reveal the presence of a newly formed corpus luteum showing that ovulation had occurred.

Cow	History	Date of Removal of C. L.	Date of Estrum	Number of Days Required for Appearance of Estrum
No. 1	Was bred on April 6, 1923. Thought to be in calf. Upon being examined June 22, 1923, found not to be pregnant.	June 22, 1923	June 25, 1923	3
No. 2	Calved April 4, 1923. Has not been in estrum.	June 22, 1923	June 29, 1923	7
No. 3	On account of absence of estrum was thought to be 60 days in calf. Not pregnant.	June 22, 1923	Did not show signs of estrum, or passed through heat unnoticed.	
No. 4	Bred March 6, 1923, and on account of cessation of estrum thought to be in calf. Not in calf.	June 22, 1923	June 25, 1923	3
No. 5	Bred April 25, 1923. Thought to be pregnant. Not in calf.	June 22, 1923	June 24, 1923	2
No. 6	Bred April 3, 1923. Thought to be pregnant. Not in calf.	June 22, 1923	June 27, 1923	5
No. 7	Suffered metritis following the birth of twin calves. Was bred Oct. 2, 1922. Was in estrum six or seven times but was not in breeding condition. Bred April 1, 1923. Not in calf.	June 22, 1923	June 26, 1923	4
No. 8	Corpus luteum removed April 12th, three months following calving. Bred April 20th. There was cessation of estrum, and cow was believed to be in calf. Not in calf.	June 22, 1923	June 25, 1923	3
No. 9	Calved March 31, 1923. Had not been in estrum since that date.	June 22, 1923	Failed to come in heat, or if ovulation did occur there were no signs of estrum.	
No. 10	Aborted March 2, 1923. Has not been observed in estrum. Two corpora lutea removed from same ovary, indicating that estrum has occurred in this cow, but passed by unnoticed.	June 23, 1923	Has not yet appeared in estrum July 7, 1923.	

Cow	History	Date of Removal of C. L.	Date of Estrum	Number of Days Required for Appearance of Estrum
No. 11	Calved normally May 16, 1923. Fetal membrances not retained. Has not been observed in estrum. Cow on official test.	June 27, 1923. C. L. removed from each ovary indicating that this cow has been in estrum since calving.	June 30, 1923	3
No. 12	Had not appeared in estrum since calving. Calved March 3, 1923.	June 7, 1923	June 11, 1923	4
No. 13	On March 3, 1923, cystic c. l. removed. Bred March 9, 1923. There was cessation of estrum. June 7, 1923, not in calf. Has retained c. l.	June 7, 1923	June 9, 1923	2
No. 14	Thought to be pregnant, but proved not to be. Retained c. l.; removed March 3, 1923. Was bred March 9, 1923. Cessation of heat. June 7, 1923, not in calf. Retained c. l.	June 7, 1923	Signs of estrum occurred on June 9, 1923.	2
No. 15	On December 23, 1922, thought to be in calf. Not pregnant. c. l. removed.	Dec. 23, 1922	Dec. 26, 1922	3
No. 16	Calved March 5, 1922. Came in heat May 21, 1922. Cessation of estrum thereafter until operation.	Dec. 23, 1922	Dec. 26, 1922	3
No. 17	Metritis following calving. Absence of estrum due to retained c. l. Approximately three months standing.	March 3, 1923	Mar. 16, 1923	13
No. 18	Cystic c. l. in r. o., but appearing in estrum regularly.	March 3, 1923	Mar. 8, 1923	5
No. 19	Was thought to be in calf. Proved not to be pregnant.	March 3, 1923	Mar. 6, 1923	3
No. 20	Calved normally Nov. 27, 1922. Absence of estrum due to retention of c. l. in right ovary.	Dec. 23, 1923	Jan. 6, 1923	13

CONDITION OF THE SIRES

Sire	Age	Physical Condition	Serological Tests	Remarks
Angus	2	Normal	—	This animal has recently been purchased to replace old sire which became affected with impaired breeding efficiency following a season on show circuit. There were no structural changes in any of the organs, which could be detected, but the spermatozoa were not numerous and the motility was only slight.

Condition of the Sires

Sire	Age	Physical Condition	Serological Tests	Remarks
Hereford	5	Normal	+	
Shorthorn	3	Normal	—	
Holstein	11	Normal	—	This animal is no longer an active breeder and is probably suffering with reduced fertility due to advanced age. A young sire has recently been purchased.
Guernsey	6	Normal	—	
Ayrshire	5	Normal	—	
Jersey	8	Normal	—	

The Relation of the Sire to Breeding Efficiency

It is frequently stated by constructive breeders, that the sire is more than fifty percent of the herd, and while many of the best known breeders owe their fame and success to a great sire, it should not be forgotten that numerous other equally well known breeders owe their success to possibly one or two great producing females. Impaired breeding efficiency on the part of the sire is a definite and occasionally a serious cause of lessened or reduced fertility. Sterility in the male animals occurs less frequently than in the female, but its importance should not be overlooked. Numerous sires affected with impaired function of the reproductive organs, are not always affected with structural changes of the genitalia as a result of infection, but may be wholly or partially infertile due to physiologic causes. Breeders will often continue the use of a proven sire, which has reached an advanced age. This practice is in a measure desirable and constructive breeding, but it must be judiciously performed, or the owner will suddenly and violently be awakened to the fact that he has a large number of cows with healthy reproductive organs, that have failed to conceive as the result of having been mated with a sire of reduced breeding efficiency. Advanced age, overfeeding, obesity or over condition as is frequently observed in cattle used for show purposes, together with lack of exercise, are all important factors in connection with sterility or failure to reproduce. The sire also may be rendered sterile as a result of injury to the sheath, penis or testicles, or from specific infections of the various genital organs. Tuberculosis of the male genital organs is occasionally observed, also actinomycosis, but the latter less frequently. Orchitis is a common condition in the bull, the etiology of which is not always easily determined. In a certain percentage of cases, according to my own observations, it probably results from trauma, while in others, it is due to the invasion of various microorganisms, which in all probability, reach the testicle by way of the blood or lymph streams. Bacterium abortus is capable of producing acute and extensive inflammation, characterized by degeneration, necrosis and finally abscess formation of the testicle. In our

Fig. 6. Testicle of Bull. Acute orchitis, from which Bacterium abortus Bang was solated.
A. Testicular tissue showing degeneration hyperemia and focal necrosis.
B. Hyperemia, edema and leucocytic infiltration.
C. Edema and infiltration of the tunics, with large numbers of leucocytes.

laboratories this organism has been isolated once in orchitis of the bull and once of the boar, and in each instance in pure culture. Other pyogenic organisms, particularly the streptococci are no doubt important factors in the etiology of orchitis, also in the causation of

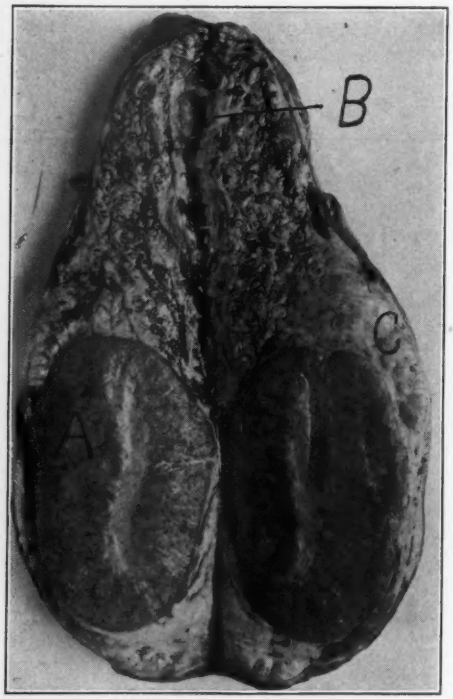

Fig. 7. Testicle of Bull, with Chronic Orchitis.

A. Portion of spermatic cord which is enlarged and indurated.

B. Testicle which has undergone degeneration and in which necrosis is extensive.

inflammatory conditions of the seminal vesicles, a condition which according to Williams (9) is said to be an important factor in connection with breeding efficiency of the bull. The attention of stockmen should be called to the importance of the sire in the problem of breeding efficiency, and to carefully guard his breeding ability, not only by careful feeding and management, but by mating him only with cows with healthy reproductive organs. He should also be subjected to periodical and regular physical examinations, as well as occasional microscopical examinations of the semen. Impaired breeding efficiency of the sire as a result of infection of the accessory genital organs, especially those conditions involving the seminal vesicles, has not been frequently encountered in our investigations.

Breeding efficiency, as stated elsewhere, is a vital problem with the breeders of purebred cattle. Of all the difficult conditions which beset the breeder of cattle, none is greater than the problem of reproduction. Without knowing the breeding efficiency of cattle free of infectious diseases which attack the reproductive organs, it is impossible to state the amount of influence these various diseases have in connection with reproduction. We, however, feel safe in saying that with the control or eradication of bovine infectious abortion, the breeding efficiency of our herds would rapidly increase. There is probably very little difference in the breeding efficiency of dairy and beef cattle, though it would seem that reduced fertility, incident to forced lactation, is a handicap with which the breeder of beef animals does not have to consider. We are submitting the breeding records of two herds of cattle, one dairy and the other beef. It will be noted that the breeding efficiency is nearly equal, though the dairy herd shows by the serological tests to be much more seriously infected by Bacterium abortus Bang. This is partly explained by the fact that the dairy herd is being used for experimental purposes and a number of the animals have received injections of living cultures of the Bang organism. By totalling the combined ages of the cows, and then deducting the combined ages of all animals represented at the time when breeding was begun, and dividing this figure by the number of pregnancies, it gives a calf for each animal in approximately one and six-tenths years.

In closing, I should like to urge the continual practice of rigid herd and stable hygiene.

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DAIRY HERD

Animal No.	Age in years	No. of pregnancies	No. of living calves	No. of retained placentas	Calves aborted	No. of services for pregnancy	Reaction to blood test on B. abortus
1	10-11	7	7	2	0	2.14	+
2	8-9	5	3	2	2	3.4	+
3	3-4	2	2	0	0	2	+
4	3-4	2	1	0	0	1.5	—
5	3-4	2	1	0	0	2.5	—
6	3-4	2	1	0	0	2.5	—
7	3-4	1	1	0	0	2	+
8	3-4	1	1	0	0	3	—
9	2-3	1	1	0	0	3	—
10	2-3	1	0	0	0	4	—
11	2-3	1	0	0	0	3	+
12	2-3	0	0	0	0	3	+
13	2-3	0	0	0	0	3	+
14	2-3	1	0	0	0	1	+
15	2-3	0	0	0	0	0	+
16	5-6	4	2	1	1	2	+
17	1-2	1	0	0	*1	1	+
18	3-4	2	1	0	0	2.5	+
19	2-3	0	0	0	0	3	—
20	13-14	8	8	2	0	3.4	—
21	4-5	3	0	0	0	2	+
22	2-3	1	1	0	0	1	+
23	2-3	1	0	0	0	5	+
24	2-3	1	0	0	0	9	+
25	1-2	1	0	0	0	4	—
26	1-2	1	0	0	0	1	+
27	3-4	2	1	1	0	2	+
28	10-11	2	0	1	1	1	+
29	6-7	1	1	0	0	5	+
30	12-13	9	8	0	0	1.3	—
31	4-5	3	2	0	0	1.67	+
32	3-4	2	0	1	1	3.5	+
33	3-4	1	1	0	0	8	+
34	3-4	2	1	0	0	1	+
35	3-4	2	1	1	1	1	+
36	3-4	2	1	0	0	2	—
37	2-3	2	0	1	1	1	+
38	2-3	2	1	0	0	1	—
39	2-3	2	0	1	1	2	+
40	2-3	1	1	0	0	2	—
41	2-3	1	0	0	0	1	+
42	2-3	1	0	0	0	3	+
43	5-6	?	?	1	1	?	+
	Total	84	51	14	10		70%

*Mechanically produced by removal of corpus luteum. Was bred to sire of different breed.

BEEF HERD

Animal No.	Age in years	No. of pregnancies	No. of living calves	No. of retained placentas	Calves aborted	No. of services for pregnancy	Reaction to blood test on B. abortus
Shorthorns—							
1	3-4	2	1	0	0	4.5	+
2	5-6	2	0	2	2	6	+
3	3-4	2	1	0	0	4	—
4	3-4	1	0	0	0	1	—
5	2-3	1	0	0	0	3	—
6	3-4	2	2	0	0	7	+
7	2-3	0	0	0	0	1	—
8	1-2	0	0	0	0	2	—
Herefords—							
9	7-8	6	6	1	0	1.67	+
10	5-6	3	3	0	0	2	—
11	4-5	3	3	0	0	1.33	—
12	3-4	2	1	0	0	1.5	—
13	3-4	1	1	0	0	3	—
14	2-3	1	0	1	1	1	—
15	2-3	1	0	1	1	2	+
16	1-2	1	0	0	0	2	—
17	2-3	1	0	0	0	2	—
18	2-3	1	1	0	0	1	—
Aberdeen Angus—							
19	8-9	4	4	1	0	3.5	—
20	7-8	5	4	1	1	2.67	+
21	6-7	4	3	1	1	1.5	—
22	5-6	3	3	0	0	5	+
23	3-4	1	0	0	1	11	—
24	9-10	1	1	0	0	6	—
25	3-4	1	0	0	0	12	—
26	3-4	2	1	0	0	1.25	—
27	3-4	2	0	1	1	1.33	+
28	2-3	1	0	0	0	5	—
29	2-3	0	0	0	0	3	—
30	2-3	1	0	0	0	1	—
Nurse Cows							
31	3-4	2	1	1	0	2	+
32	3-4	2	1	0	0	1	—
33	2-3	1	0	0	0	1	+
34	3-4	2	*2	1	0	1	+
35	3-4	2	1	0	0	1	+
36	3-4	2	1	0	0	1	+
37	2-3	1	0	0	0	1	—
38	2-3	1	0	0	0	1	—
39	2-3	1	1	0	0	2	+
	Total	69	42	11	8		36%

*Twins.

The Control of Stomach Worms of Sheep*

By E. M. Nighbert, Veterinary Inspector Zoological Division, U. S. Bureau of Animal Industry, Queen City, Missouri.

The patient and careful work of investigators is always slow. Conclusions may be reached, but they must be confirmed, which requires repeated trials over long periods of time. The trained and experienced veterinarian is the main medium through which important facts pertaining to livestock diseases can be safely entrusted. At the same time, the more reliable knowledge livestock owners have of conditions detrimental to their industry, the better and more effective the measures adopted by the veterinarian in dealing with serious conditions of farm animals.

A wide dissemination and use of reliable information in regard to the injury and losses caused by stomach worms is not only desirable, but important and necessary, especially throughout the older farming regions of our country, where large numbers of animals are assembled on smaller farms and permanent pastures.

Life History and Distribution of the Stomach Worm (Haemonchus Contortus) of Sheep, Goats and Cattle

Stomach worms of sheep are widely distributed throughout the world. It is one of the most important internal parasites affecting the sheep industry of the farming regions of the middle-western, eastern and southern states. The drier regions of the west are not so favorable for their development. Goats and cattle are favorable hosts for this parasite. In the middle-western and eastern states cattle are not an important factor in propagating the parasite, except under most favorable conditions, which are over-stocking permanent pastures with young animals. The cattle industry of the mild climate of the southern states suffers great injury and losses from the worm.

Ransom (1906) of the U. S. Bureau of Animal Industry was the first investigator to work out the life history, while Veglia (1915) of South Africa, not only confirmed the American achievement, but greatly extended the study of the parasite in more elaborate details. What interests us today is, the practical details of the life cycle, habits, treatment and methods of control and possible eradication of the parasite.

*Presented at Missouri Valley Veterinary Association Meeting, St. Joseph, Mo., February 19, 20, 21, 1924

The adult worms live in the abomasum; the full grown female measuring about one inch, the male about two-thirds of an inch in length; both sexes are slightly smaller than an ordinary pin. Many thousands of these worms may be found in the stomach of a single animal. The female has a spiral striped appearance, the result of the reproductive organs being twisted around the intestine. Both male and female have a pinkish appearance. Upon post-mortem examination they are found almost exclusively in the abomasum; seldom being found in the intestines.

When numerous they appear as an active wriggling mass or, in clusters around the folds of the stomach walls. Copulation takes place in the stomach of the host animal. According to Veglia, each female is capable of depositing from three to five thousand eggs. The worms may be so numerous, that a single sheep may pass out in the feces, more than three million eggs in twenty-four hours.

The Egg

The egg is of microscopic size, measuring about 1/350 inch in length. It undergoes changes as it passes through the intestinal tract, preparatory for hatching upon reaching the ground. The moist warm weather of spring and summer are the favored seasons for hatching. At temperatures below 40° Fahrenheit the eggs lie dormant. At freezing temperature many are destroyed. In favorable places where protection is afforded from the cold, the egg remains viable. Upon reaching the ground the egg will hatch within 14 to 24 hours into the larval worm.

The Larvae

The larval worm undergoes three stages on the ground.

1. The first larval or hatching stage is a thread-like worm, measuring about one-eightieth inch in length. It feeds upon the organic material present and is very active for eight to twelve hours, then it is quiet for a similar period. At the end of this period it casts its skin and emerges as a second stage larva.

2. The second stage larva is about one-fiftieth inch in length and is very active for about thirty-six hours, after which it is more or less quiet for ten or twelve hours. Having undergone changes in its internal structure, also de-

veloping a new skin; however, the old skin is retained intact, the new forming an enveloping sheath. The worm now appears in the third or infectious stage of development.

3. The third stage larva is designated the infectious stage, because in this stage the larval worm, while very active no longer feeds. In this stage it is able to ascend blades of grass when covered with a film of moisture, the result of dew, fog or rain and is swallowed by sheep when grazing and the animal becomes infected with stomach worm disease. At this stage the immature worm is about one-twenty-fourth inch in length. It can move about only in the presence of moisture.

This is an important stage of the worm to be considered in adopting pasture control measures. It must be borne in mind, that the time from hatching to the third stage may vary considerably, depending upon temperature, however they may be found as early as four days after the egg leaves the host, but are not, as a general rule present on blades of grass in considerable numbers until the elapse of two weeks after the passage of the egg.

In this connection, it is readily seen that the change of a flock of sheep or lambs to and fro from pasture to pasture at intervals of two weeks, which is a common practice on many farms, has no good effect in the control of stomach worm infection.

Development of the Worm in the Stomach of Sheep

According to Veglia in his investigations from 1911 to 1915, the third stage larvae when swallowed by sheep, undergo three changes in their evolution in the stomach. When swallowed by sheep the larvae immediately cast their skin and are active for about thirty-six hours amid the mucosa cells, where their presence causes a mucous deposit. After a quiescent period of around twelve hours, the skin is again cast becoming the fourth stage larvae of different structure from, but about the same size as the third stage—about one twenty-fourth inch in length. At this stage the larvae pierce the mucosa of the stomach, draw blood and grow very rapidly. By piercing the mucosa of the stomach a small hemorrhage and coagulum is produced which surrounds the worm and in which the worm rests and develops.

About five days after the larvae have been swallowed, the sex can be distinguished. In nine to eleven days after infection the skin is again cast, and in about fifteen days from the time of infection the worms have reached the adult stage, and may be seen in copulation and depositing eggs. Therefore it will be seen that the period of time between the hatching of eggs and the adult stage of the parasite in the stomach of sheep, is about thirty days, computed as follows:

Egg to infectious stage on grass blades..14 days
Reaching the adult mating stage in stomach .....16 days
Total .....30 days

Accordingly, it can be fully realized that the life cycle of the stomach worm of sheep must be understood, because it gives us a point—a weak point to attack in adopting measures of control and eradication.

Nature and Habit of the Stomach Worm (Haemonchus contortus) of Sheep

The rapid and certain development of the larvae from hatching of the egg to the infectious stage, depends upon temperature, moisture and topography of country. High and hot arid regions remain practically free of the parasite, while the moist summer climate of the greater portion of our country is at all times infested where sheep are handled. The immature parasite must have moisture to be able to move about on objects; otherwise, functional activity is retarded and death, after passing through unfavorable conditions, will soon result.

The winters of the northern states practically destroy all eggs and larvae left in the pastures. However, the third stage infectious larvae on the grass are very resistant to dryness and cold and may retain their vitality for nine months under climatic conditions of the District of Columbia.

Furthermore, it appears to be the nature of the parasite to remain in the stomach of untreated sheep over long periods of time, though the host animal may have been removed from all possible sources of infection, that is continual reinfection. Experimental information on this point shows, that after removal from all sources of infection, sheep will carry the parasite over a period of 19 months. This is an important factor, and in a large measure accounts for continual pasture infestation from year to year in the northern farming states. The stomach worm is a blood sucking parasite and is found almost exclusively in the fourth stomach of the host animal.

Stomach Worm Disease

This parasitic condition of sheep is one of the most important pests affecting the sheep industry. It is widespread throughout the United States and other countries of the world. The parasite was probably introduced with early importations of sheep from foreign countries.

The injury and losses are greater in the growing lamb and aged sheep, but all sheep using permanent pastures suffer more or less injury and, in many instances death, unless measures are adopted to prevent and control the trouble. The disease is known by many synonyms, such as, "paper skin," "drying up," "black scour," "twisted wire worm disease," "bottle jaw," "poverty jaw," "verminous gastritis," etc.

History

The flock may have been housed in winter during stormy weather and, have done well throughout the cold season. The bred ewes may have had the run of a pasture for grazing and exercise and lambed satisfactorily. Here it is well to state, that when sheep are brought into winter quarters, or during the winter season, the number of worms in the stomach naturally diminish, which favors, along with better feed and attention an improved condition. As spring comes and grass begins to appear sufficiently for sheep grazing, the flock, including ewes and lambs are turned to grass for the season.

It is an important fact, observed in experimental work, through tests and postmortem examination, that February and March lambs while suckling the first four months of their lives, suffer but slightly, if at all, from stomach worms. However, at the approach of the moist hot summer months infection begins to show in them.

Symptoms

The first indication is unthriftiness in the lambs and aged sheep, lusterless fleece and lack of vigor. Upon palpation the fleece appears harsh and there is loss of flesh. In the early stages diarrhea may or may not be present. The lamb exhibits thirst, reflective cough and remains close about the watering place. The animal lies about and feeds sparingly and intermittently. Later, the symptoms described are more pronounced, diarrhea is usually present, anemia is manifested in the mucous membranes of eyes and mouth, including the skin. The circulation is weak and temperature subnormal. The animal may be found off to itself unable to follow the flock, later going down, dying from sheer exhaustion.

The disease may be classed into two types, acute and chronic. In the first instance, death in lambs may result within three or four weeks from the time the first symptoms appear, while in the chronic type the disease may run a course of two or three months.

Sheep over one year and under six years of age, appear to be better able to resist the ravages of stomach worms to a remarkable extent, while the growing lamb and "broken mouth" sheep fall easy prey to the disease. There is no reliable information as to the death rate from this disease; however, in the farm flocks throughout the country it is believed to be comparatively large. The injury and loss is best reckoned from an economical standpoint.

The economical losses from this disease may be computed as follows:

1. The milk flow from the nursing dam is retarded, thereby interfering with the rapid, normal development of the growing lamb.
2. The growth of fleece is interfered with, resulting in many instances of poorer quality of wool and less weight per fleece.
3. The condition accounts for excessive culls both in lambs and sheep when marketed.

In this connection, while there are no reliable figures on the death rate of lambs and sheep from this disease, our experience and inquiry, indicate that losses are from 10 to 20 per cent in flocks of 50 to 100 head of animals per annum.

Postmortem Appearance

In typical cases of stomach worm disease, the macroscopic lesions are confined principally to the fourth stomach. There the worms will be found in the stomach content, a wriggling mass and, in clusters about the folds of the mucous membrane. The mucosa is congested and circumscribed inflamed patches observed. Also numerous minute petechial spots, the result of piercing the mucosa by the worm, can be readily seen. The major glandular system of the abdominal cavity indicates functional exhaustion, without pathological changes. Reddened spots here and there in the intestinal tract are sometimes present. Edema about the head, in the submaxillary space, the eyelids, ears and side of the neck in advanced chronic cases is often present. It is generally conceded by all students of stomach worm disease, that the parasites eliminate from their bodies a toxic material, that is absorbed which accounts for rapid depletion of the red blood cells, resulting in anemia and the associated complications.

Diagnosis

Due to the fact that internal parasites of various species are the chief enemy of sheep, a definite confirmed diagnosis of stomach worm disease is important. The symptoms outlined while important, cannot be exclusively relied upon in detecting the presence of stomach worms. Two steps are necessary in making a definite diagnosis.

First, it is usually necessary that an animal or two be destroyed to determine the presence, not

only of stomach worms, but also the presence of intestinal and pulmonary parasites that may be a complicating factor. Also, pathological changes that may be the result of some other infection can be observed.

Second, the feces can be examined for eggs, also incubated at room temperature for hatching eggs that may be in the feces. These steps are so simple and practical, that any practicing veterinarian can do it.

The following points should be noted:

(a) Collect a few fresh feces, either by removing a pellet or two from the rectum of four or five animals with the middle finger, or have a few animals confined so that fresh dropped feces can be secured.

(b) If a microscope is possessed, take a particle of the fecal material on a toothpick, place on a slide, add one drop of water, spread and examine for eggs.

(c) If no microscope is at hand take a batch of fresh feces and place them in a clean, clear glass receptacle, add a few drops of water, securely stopper or cover same and place anywhere in a room that is comfortable for a person. The specimen should be protected from bright sunlight. A clear jelly-glass, drinking glass or clear glass vial will serve the purpose. Sufficient number or amount of feces to cover bottom of receptacle should be used.

On the fourth day after the feces have been placed in the receptacle, the specimen should be examined. If larvae have hatched they will be seen with the naked eye moving about in the film of moisture on the sides of receptacle, or motionless in clouds or clusters, depending on numbers and the amount of moisture adhering to the sides.

Since it is the habit of the larvae to move up and down in the presence of moisture and suitable temperature, the specimens should be examined daily for five or six days, or longer to be sure of seeing them in action. The question may be raised as to the presence of other varities or species of worms, which will be mentioned later.

Treatment, Prevention and Control

The American system of permanent pastures and grazing areas had to be considered in devising plans and methods, of dealing with the parasite. Methods of treatment and control to be practical, must conform, if possible to the customary plan of handling sheep upon the farm.

To carry this idea out, about the year 1914 the Zoological Division of the U. S. Bureau of Animal Industry, through Dr. Ransom its chief, arranged to conduct experimental work of treatment and control on a government leased farm near Vienna, Virginia, under the immediate supervision of Dr. Cooper Curtice.

The use of copper sulphate was reported to be very effective in the control of stomach worms in cattle and sheep by Hutcheon of South Africa during 1892 to 1905. Accordingly this chemical in connection with crop and pasture rotation was the means adopted in the experimental work at Vienna, Va. After eight years of tests, Curtice reports excellent results from the use of one per cent solution copper sulphate, administered once a month to sheep, not dosing lambs until weaned or until they were about four months of age. The dose that was found to be safe and most effective is as follows:

For 80 pound sheep —4 fluid ounces.

For 70 pound sheep —3½ fluid ounces.

For 60 pound lambs —3 fluid ounces.

Weights may be estimated, but the dose must be accurately measured. Pregnant ewes within two weeks of lambing are not dosed, simply to avoid handling them. Immediately after lambing they are dosed. The experimental work in the study and treatment for stomach worms, conducted by this Bureau prior to the Vienna, Va., work, coupled with the work at Vienna, demonstrated that it was practical to control stomach worm infection and, that it was possible to eradicate the parasite on farms.

Apparatus for administering copper sulphate solution to sheep.

In order to continue the experimental work, under the general farm practice of handling sheep, the writer was assigned to Schuyler County, Missouri, in 1922. A maximum of 2000 sheep and lambs have been under experimental treatment with one per cent copper sulphate solution from October 1922 to the present time. The work consists of dosing each flock once every twenty-five to twenty-eight days, under my personal supervision, the ani-

mals using permanent pastures, also having the run of fields and meadows at suitable times of the year. Collecting, examining and incubating feces were carried out regularly, with the view of checking and noting the results of treatment.

The work in Schuyler County well supports previous findings at Vienna, Va., namely, that sheep and lambs can continuously use permanent pastures, if dosed once a month with one per cent copper sulphate solution, without losses or injury from stomach worms. This conclusion was reached by means of laboratory record, postmortem examination at time of slaughter and on the farm. All good sheepmen recognize the importance of frequent change of the flock to fresh clean grazing ground. With such practice in systematic operation, including the use of 1% copper sulphate solution, complete eradication is possible.

The question of the presence of different species of worms harbored in the intestinal tract, is important in connection with dealing with stomach worms. However, from a practical standpoint, with a few exceptions, it is found by the systematic use of copper sulphate solution such worms are not only held in check, but completely controlled and, in most instances disappear. Also the solution has a decided effect in expelling tape worms.

Preparation of the One Per Cent Copper Sulphate Solution

The writer uses what he terms the Curtice formula, prepared as follows:

Copper sulphate, C. P.—1 pound, av.

Dissolve completely in two quarts of boiling water.

When finished it should measure two full quarts; if not add water to make up the loss. This is the stock solution and not yet in safe form for dosing. Tightly stoppered it will keep indefinitely. For dosing sheep, take four fluid ounces of the stock and pour it into three quarts of water; the mixture is then practically a one per cent solution and, must be accurately measured into each dose before administering to sheep.

The utensils used in preparing the chemical must be enamelware. For storing the stock, use glass or earthenware. Also use enamelware in making up the solution in the field for dosing.

Administering the Solution

For dosing, the apparatus best suited for the work, is an enamel, glass or hard rubber funnel, 3½ feet, of best rubber tubing ⅜ in. in diameter and a brass or copper nozzle or tube 6 in. long, all fitted together. For measuring the dose, a glass graduate, enamel dipper or cup is best, one being able to use the two latter more quickly in handling and dosing large numbers of animals. The particular kind of material mentioned is necessary as the solution corrodes other kinds of metal.

To dose a sheep or lamb one must be patient and careful, in order to prevent the solution from passing into the trachea. The flock should be confined to close quarters, setting aside a small space that will hold 25 or 30 sheep for catching, dosing and turning out. To properly and safely dose a sheep, have attendant straddle the animal, keep in standing position in corner or against wall, keeping nose level with eyes. The attendant places tube in mouth and the dose is poured through dosing apparatus. In this way two men under the supervision of veterinarian can dose from 50 to 100 sheep per hour.

Delayed pubescence, shortened period of sexual activity, reduced fecundity and increased sterility are induced by a restricted diet. It has been demonstrated that the line of descent will become extinct in experimental animals in the third generation by Slonaker and Card. —(Am. Jr. of Phys.)

According to Dr. Henry C. Sherman, Professor of Chemistry of Foods of Columbia University, children should consume one quart of milk each day. Dr. Sherman is an authority on food problems and no doubt the vital statistics would soon reflect the wisdom of the milk drinking program suggested.

In December 1823 William Prouts, an English chemist, demonstrated the presence of hydrochloric acid in gastric juice to the Royal Society of London. Prouts experiments were carefully checked before the Royal Society finally approved the statement that H cl was a constant ingredient in normal human gastric juice.

Paris is attempting to safe-guard the consumers of milk in that metropolis. The prefect of police recently issued an order that milk consigned to either wholesalers or retailers must be shipped in sealed containers. The order also prohibits transferring of the contents of milk vessels enroute.

Sarcoptic Mange in Swine Increasing

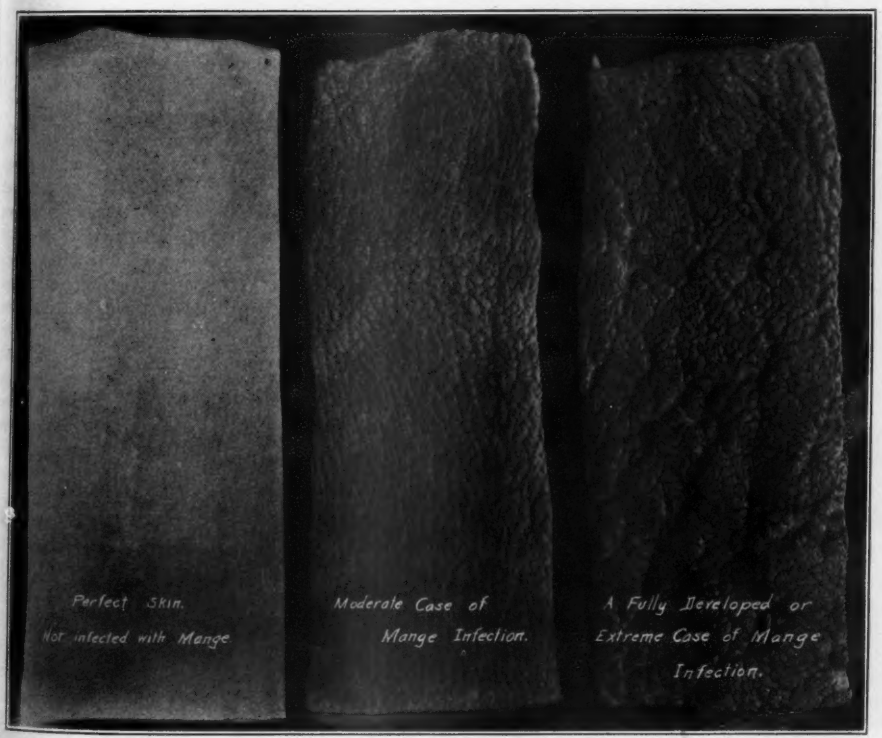
By A. T. Kinsley

Mange or scabies of different species of animals has prevailed in varying degrees in the United States. The disease has been relatively common in cattle, sheep and horses at different times in certain districts. Mange is also very prevalent in dogs and cats. In fact, some veterinarians have said that all dogs should be considered to be infested with mange parasites. This malady has occurred in swine, but until recently it has been considered of little importance in those animals.

Decreases Value of Pork Products

In some sections of the north central states, it has been found that mange in swine is widespread and is costing the producer 60 cents for every hog sold to the packer because of the depreciation in the value of the cuts of meat. There is an additional loss to the producer because the affected animals become unthrifty and require additional quantities of feed.

Mr. H. F. Veenker, superintendent of Morrell's packing plant at Sioux Falls, S. D., who has furnished the photographs for the accompanying illustrations, has recently issued a state ment to the effect that the loss from mange in marketed hogs approximated $326,400 in South Dakota during 1923. It is estimated that 40% of the hogs slaughtered during the winter months show evidence of the mange mite, the damage being varied in degree, some hogs showing only a slight effect, others more and again others in the very extreme stage, to where the skin must be condemned as unfit for food.

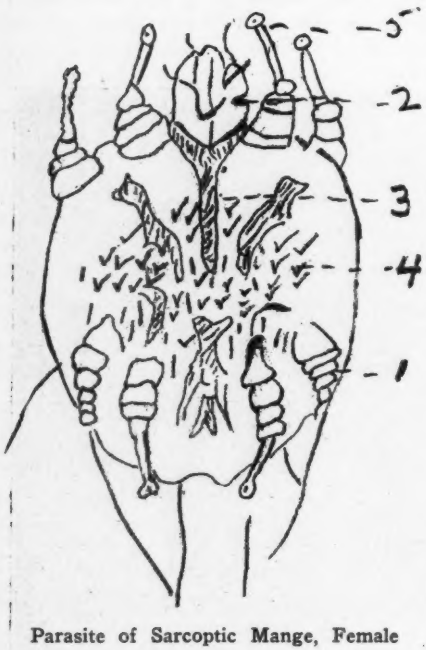


Mr. Veenker further states that the average hog yields 35 lbs. of hams, 30 lbs. of bacon and 15 lbs. of picnic hams, or a total of 80 lbs. representing primal cuts, and it so happens that mange usually attacks these parts that are of the greatest value. In South Dakota,

and no doubt in other states as well, the trouble has become worse each year until the big marketing season of 1923 and 1924 has shown it at its worst stage.

Methods of Transmission

Sarcoptic mange in swine is a parasitic-dermatitis caused by the Sarcoptes scabiei var. suis. These are very small obligatory parasites, although it is possible that swine may become infested from contaminated hog houses, cars, etc. The disease is contagious; that is, contact is sufficient to permit of the passage of the parasites from infested to non-infested



Parasite of Sarcoptic Mange, Female

swine. By this means all swine in a lot usually become infested with mange. Because of contact transmission of mange, the disease is most prevalent in the winter months when the animals are housed. Mange is usually carried from one herd or flock of animals to another or from one farm to another by infested animals, although it may be possible for birds to carry the parasite from one premise to another. Mange was spread to 76 different farms in one of the northern states by infested breeding swine that had been sold at one public auction.

Symptoms

Mange is a parasitic dermatitis manifested by an intense pruritis. Parasites first invade the soft skin around the eyes and ears and then gradually extend to various parts of the body. The sarcoptes burrow into the dermis producing papules which later become vesicles, and when the serum escapes from the vesicles it accumulates in varying quantities forming scabs, the extent of which will depend upon the accessibility of the part to rubbing. There is usually more or less falling of bristles. As the disease progresses, the skin becomes scurvy like, thick and wrinkled and frequently contains deep crevices or rhagades. Although the disease may occur at first in only one animal in the lot, it usually spreads until all animals in one yard or barn are affected.

The principal damage done by this parasite is in the skin, although the constant irritation results in unthriftiness and animals frequently become very thin, emaciated and may actually die of exhaustion.

Lesions

The lesions produced by the sarcoptes are practically confined to the skin, excepting secondary conditions that may arise as a result of exhaustion. The parasite obtains tissue juice by pricking the skin with its stylet. The stylet injury produces erythema and infiltration which is succeeded by vesicular formation; later the vesicles may or may not rupture, the fluid becomes dry, thus forming a scab beneath which the parasites are found. Galleries are formed within the skin particularly by the female parasite and this also adds to the irritation. The accumulated dry scab breaks and damages the hair which leaves the affected parts hairless. The continuous irritation produces inflammation and there is fibrinous proliferation and thickening of the skin. The thickened skin loses its pliability and becomes fissured or cracked.

Treatment

Mange in swine is not difficult to control, providing the life cycle of the parasite is taken into consideration. The ovigerous female sarcoptes burrows into the skin, forming galleries in which approximately fifteen eggs are deposited. The ova or eggs hatch in from five to ten days into the six-legged larva which may remain in the galleries or may migrate out under the scabs. In two or three days the larva undergoes a change or molt. Another molt occurs in two or three days, thus evolving the sexually mature parasite, which mates

and in from three to five days the ovigerous female burrows into the skin for the purpose of depositing her eggs.

Bearing in mind the fact that the life cycle requires from fifteen to possibly twenty-five days and also the fact that the eggs are deposited within the skin, it is apparent that the treatment must be repeated three or more times at ten-day intervals. Crude oil or kerosene in some form has been found most effective in the treatment of this disease. The lime and sulphur dip is of little value in the control of sarcoptic mange in swine. Simultaneous with the dipping, the beds and quarters should be thoroughly cleaned and disinfected. It would be more satisfactory to dip the animals and turn them on to virgin soil. In those cases that have been affected for a considerable period of time, it is usually necessary to apply more than three dippings as the rough, wrinkled skin is not easily penetrated by dip solutions.

Unfortunately, this disease is usually not treated because of the fact that it does not cause death and the producer is not aware of the damage resulting from the parasite. Unless this disease is placed under control, it is apparent that it will become quite widespread, probably over the entire corn belt within a few years time. There should be some regulations instituted governing the shipment of hogs from infested territories. It would seem justifiable that there should be a veterinary inspection of all sale hogs whether they are to be shipped intrastate or interstate, and all hogs found to be affected with mange should be prohibited from shipment until they are known to have been freed of the parasite that produces the disease.

Different degrees of damage from mange. The carcass in the center shows an unaffected specimen.

The lesions of tuberculosis in swine is localized in the majority of cases. There is a possibility that these local-lesion tuberculous cases in swine are of avian origin according to Van Es.

Is lousiness a sequel or the cause of unthriftiness in swine? Lice can be exterminated or reduced to a minimum by periodical dipping. Hog wallows are a nuisance and should be eliminated.

Shipping Fever in Horses and Mules

By F. F. Smith, Kansas City, Kans.

The existence of an infectious transmissible disease of solipeds that pass through public stock yards, sales barns and those transported by rail or transport is common knowledge to horse dealers, shippers and veterinarians. The exact identity of this disease has not been determined. It is an acute infectious disease, characterized by catarrhal inflammation of the anterior respiratory tract, with or without suppuration of related lymph glands and is frequently associate with pneumonia or pleuropneumonia. For convenience the uncomplicated form is usually designated as the catarrhal form and the complicated type as the pectoral form.

Catarrhal fever is very prevalent throughout the United States and other countries. As the name implies, the disease is more prevalent in horses that are marketed and more particularly those that are shipped although it sometimes becomes enzootic in agricultural communities. The percentage of fatality varies from one to sixteen. The high percentage fatality occurring in the pectoral form; that is, in those cases that are complicated with pneumonia, the percentage of fatality, although rather high, is not as serious as is the depreciation due to loss of condition of the affected animals and the further loss of time and amount of feed necessary to put the animals back into condition and again the disease frequently leaves the animals defective in some ways as cardiac disturbances, emphysema, etc. Economically considered, this disease probably costs the horse industry more than any other disease.

The disease under consideration is not the old type of disease known as "pink eye" or influenza, although the two diseases may occur simultaneously. The infectiousness of this disease has been recognized since about 1850, the exact specific cause is still a mooted question.

Causative Organisms Implicated

A variety of microorganisms have been identified with catarrhal fever by laboratory workers and probably the large number of microbian agents that occur in this disease explains the multiplicity of lesions that characterize it.

According to laboratory findings, streptococcus and B. equisepticus are the most common and probably the most important microorganisms associated with this disease, although various other pyogenic cocci may be of some importance. Streptococci have been isolated from nasal discharges and blood from a large percentage of cases showing a catarrhal condition of the anterior respiratory tract. The streptococci isolated from horses or mules affected with catarrhal fever were, according to the laboratory report, identical microscopically, culturally and by inoculation experiments in laboratory animals with streptococci isolated from the pus of a submaxillary abscess of a colt affected with strangles. Ferry gives the streptococcus preference in the causation of catarrhal fever. Schutz in 1888 described the streptococcus equi, Sand and Hensen independently described the same organism claiming it was the cause of strangles.

Lignieres and previously Babes, have claimed the exciting cause of catarrhal fever was a bipolar staining microorganism belonging to the hemorrhagic septicemia group. The B. equisepticus is of common occurrence in the various tissues of equines that are affected with shipping fever. In fact, it appears probable that this is the most important microorganism that has been identified and is thought to be the principal microbian invader in the pectoral form of this disease. From the clinical viewpoint it is apparent that the pneumonic complications are localized hemorrhagic septicemia.

It has been suggested that a filtrable virus is the specific cause of catarrhal fever and in this relation Peel's observation is of interest. He observed a stallion that transmitted the disease by copulation. This transmission continued for months. The semen from this stallion, either entire or the filtrate, transmitted the disease and the filtered blood of infected animals also proved infectious.

That pyogenic bacteria of the various kinds that have been identified in this disease are a factor, can not be disputed. Streptococci are frequently responsible for suppuration of lymph glands as is evidenced in colt distemper or strangles and it has been found that streptococci are usually present in the pus of those cases of catarrhal fever in which suppuration of lymph glands occurs.

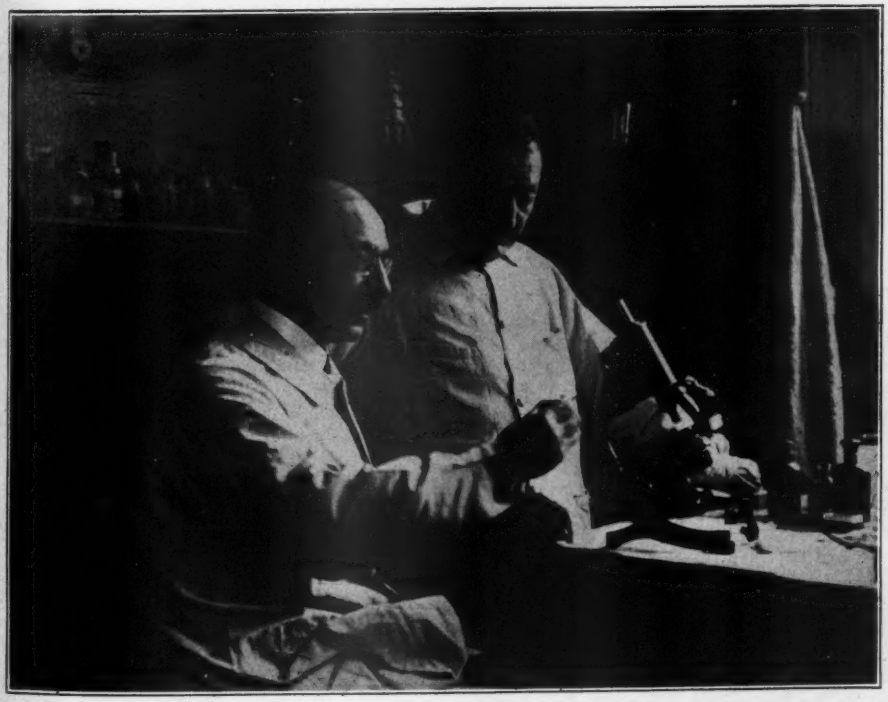
Results From Use of Bacterin

After a careful consideration of the foregoing, it was evident that various pyogenic cocci

and particularly the streptococcus, either separately or in conjunction with the bipolar microorganism, were important factors in the occurrence of shipping fever. It was decided to determine the value of a bacterin prepared from cultures isolated from some of the typical cases. Such a bacterin was prepared by a responsible laboratory and over 1000 head of mules and horses have been treated since December 1, 1923. According to our experience, the value of bacterin in the control of catarrhal fever in horses and mules is not only dependent upon the bacterial composition but also upon the dosage. The content of the bacterin was determined by the laboratory. The best results were obtained by giving 21 mil in three successive injections about five days apart, although good results were obtained by giving two injections of 8 and 12 mils. This method of procedure is not 100% successful, but it has given sufficient results that the expense incurred is justified. An occasional mule or horse that has had three injections may show evidence of disturbance by aggravated dyspnea but most of these cases respond to the intravenous injections of hemorrhagic septicemia bacterin in 5 to 10 mil doses. There have also been a few cases of pharyngitis in treated animals, and one or two well marked cases of purpura hemorrhagic have been observed.

In one barn in which about 800 mules have received two or three injections since December 1, 1923, there have been four deaths, one case of purpura hemorrhagic, and eight cases of pharyngitis. In other barns where the mules have been under practically the same conditions but not treated with the bacterin, the loss by death has been from 5 to 10%, and from 3 to 6 weeks more time is required for the animals to regain the former condition, thus causing an added expense.

It is my judgment that properly prepared bacterin when administered in sufficient dosage is of very great value in preventing the losses incident to the shipping of mules and horses.



Keystone View Co.

Dr. Y. Manouelian, well known French research expert (left) who is reported to have found a cure for rabies by isolation of the germ. With the doctor is his co-worker, M. Viala.

Vitamins and Deficiency Diseases in Poultry

By H. H. Mitchell, University of Illinois

A condition of continued good health in any animal is dependent upon hereditary, hygienic, and nutritional factors. The inheritance of a poor physique or of an organism defective in its functioning in any particular, predisposes to subnormal development and disease. The importance of clean, light, and well-ventilated quarters for live stock and of proper conditions of temperature and humidity is well recognized. Malnutrition, however caused, invites disease by lowering the body's powers of resistance to bacterial infection. If the malnutrition is of such a type as to affect adversely the functioning of the vital organs, particularly the nervous system, and circulatory system, and the endocrine system, diseases with more or less characteristic symptoms develop which are called "deficiency diseases." A deficiency of protein or of the food energy contained in carbohydrates and fats produces no specific symptoms by which it may be diagnosed. On the other hand, a deficiency of minerals or of vitamins may lead to true deficiency diseases as above defined.

A knowledge of the relation between health and adequate nutrition is, of course, of greatest practical importance in the management of those species of animals most likely to be inadequately nourished, either because poorly balanced foods are used so generally in their rations, or because the species possesses a relatively intense requirement for those food nutrients not richly supplied by the foods commonly available on the farm. Poultry, of all farm animals, are the most likely to be undernourished under practical farm conditions. Due to the nature of their digestive tract, their rations must in practice be composed largely of seeds and seed by-products, feeds notoriously ill-balanced with respect to minerals, protein, and vitamins. The necessity of balancing poultry rations with respect to protein and minerals is fairly well recognized, but it is only beginning to be realized that they are often in need of balancing with respect to vitamins. As compared with other animals, the requirements of poultry for some of the vitamins are relatively so intense that their rations should be supplemented by feeds known to be rich in these factors. A pig can grow satisfactorily from weaning to market weight on a ration of yellow corn and tankage. A chick will die in a few weeks on the same ration, because of its much more intense requirement of vitamin A, in which yellow corn is not particularly rich and tankage much less so.

Sources of Vitamins

Vitamins are manufactured by plants only. What vitamins are found in the animal body have been stored there, not produced there. The quantity of vitamin contained in animal tissues depends primarily upon the ration fed. If this is high in vitamins the animal may store considerable amounts; if it is low in vitamins, no considerable storage is possible. Animals have a surprising capacity for storing vitamin A and the anti-rachitic vitamin, but a very limited capacity for storing vitamins B and C. Such stored vitamins are found in greatest concentration in the internal glandular organs, such as the liver and kidney. The ordinary cuts of meat, though containing all of the well-characterized vitamins, are not good sources of any one. Animal body fats contain vitamin A in variable amount, depending upon the character of the diet and to some extent, apparently, upon the species of animal. Milk may contain relatively large amounts of vitamin A in its fat fraction, but under no conditions is its content of vitamins B and C exceptionally high. Eggs are very similar to milk in vitamin value, the vitamins being concentrated in the yolk. Fish liver oils are the richest known sources of vitamin A and of the anti-rachitic vitamin.

Green plant tissues are with few exceptions the best sources of vitamins known, being rich in all of these factors. In seeds the vitamins are in the main concentrated in the embryo and to a less extent in the outer coats of the seed, but the seed embryo is a reliable source only of one vitamin, i. e., vitamin B. Its content of vitamin A is variable and in no case exceptionally high, while until the seed germinates, the embryo contains no demonstrable amount of vitamin C. Seeds in general, therefore, are reliable sources of vitamin B only. They may be, as far as can be determined, entirely devoid of vitamins A and C.

Deficiency of Vitamin A

Deficiency of vitamin A in poultry rations may be expected, therefore, whenever green feed is not available. The grains are low in this vitamin, particularly white corn, wheat, oats, and rye. Mill by-products from wheat

and corn are also poor vitamin A feeds for chickens. Animal products used as protein concentrates in poultry rations, such as meat scraps, tankage, fish meal, blood meal, skim milk, and buttermilk cannot be relied upon to supplement the grains with respect to vitamin A.

The effect on poultry of a ration deficient in vitamin A is dependent primarily upon the age of the bird. The younger the bird the more intense is the requirement for the vitamin and the sooner will symptoms of malnutrition develop. Young chicks fed from the time of hatching, or shortly thereafter, on a ration practically devoid of vitamin A, such as a ration of white corn, wheat bran, and tankage, will, in so pronounced in young birds dying shortly after being placed on a ration severely deficient in vitamin A. The outward symptoms of this deficiency disease resemble those of roup. Beach has called the disease "nutritional roup" and Emmett has identified it as a deficiency disease resulting from rations deficient in vitamin A.

Postmortem Lesions

Postmortem examination of birds dying from this deficiency disease reveals a severe involvement of the kidneys. "They are usually very pale and marked with a network of very fine white lines which are urate-filled tubules" (Beach.) It has been reported that "the ure-

These chickens were put on a diet that contained all the essential factors for growth and reproduction excepting the fat-soluble vitamins. Note the condition of the eyes and the leg weakness or rickets.

from 2 to 6 weeks, succumb to this deficiency disease. They will show the symptoms collectively described as "leg weakness" including inpaired appetite, an anemic condition of the comb and wattles, drooping wings, ruffled feathers, and unsteady gait culminating in total inability to stand, and frequently an ophthalmia that has been described as follows: At first there is "a thin viscid discharge which may glue the eyelids together, then the formation of a tightly adherent, white, membranous film over the membrana nictitans and finally the collection in the conjunctival sacs of white, cheesy exudate" (Beach). This ophthalmia is the most characteristic symptom of the deficiency disease, though it may be absent or not

ters are sometimes visibly distended and appear as white ducts almost as large as a lead pencil" (Beaudette). What appears to be a visceral gout is frequently indicated by the presence of a deposit of white material, probably urates, on the liver, heart, and other organs, giving them the appearance of having been sprinkled with talcum powder. An examination of the mucous membrane of the mouth, pharynx, and esophagus reveals the presence of "pustule-like caseous patches 1 to 2 mm. in diameter," penetrating quite deeply into the mucosa. These patches "may be so numerous as to give the mucosa, especially in the pharynx, the appearance of being covered with caseous false membrane" (Beach).

Cure and Prevention

The disease described in the foregoing may be readily cured, if permanent injury has not resulted, by the administration of cod liver oil. Its prevention is assured by giving the chicks ready access to green feed, such as green cabbage or lettuce leaves, fresh alfalfa or clover, or sprouted oats. Tomatoes, either fresh or canned, would also serve the purpose well. It may prove to be an economic practice to feed cod liver oil to young chicks during the first few weeks of life, if green feed is not readily available. Three to five percent of cod liver oil in the mash may be recommended in such cases. The difficulty may also be met by feeding eggs to young chicks at the rate of one egg daily to thirty chicks. The eggs should be beaten up with skim milk and the mixture worked into the mash.

A deficiency of vitamin A is not to be expected with mature poultry, since for their own well-being mature animals are known to require a much smaller concentration of this vitamin in their feed than immature animals. The laying hen, however, offers a special problem. Some results have been obtained indicating rather clearly that the hatchability of eggs is markedly lowered when the hen is subsisting on a ration low in vitamin A.

The Anti-Rachitic Vitamin

The interpretation of experiments dealing with the distribution of vitamin A in foods and with the requirements of different animals for this vitamin has been greatly complicated recently by the discovery that **there are two fat-soluble vitamins,** occurring together in many natural products. The one concerned in the prevention of ophthalmia is still referred to as vitamin A. The other has been shown to be concerned in the etiology of rickets. The most generally used term for this factor is the term "anti-rachitic" vitamin, referring to its relation to rickets. Cod liver oil is the richest source of this vitamin so far discovered. Butter fat and egg-yolk fat also contain the anti-rachitic vitamin. Coconut oil contains this vitamin to some extent, but not vitamin A, while spinach, very rich in vitamin A, seems to possess no demonstrable anti-rachitic power. General statements concerning the distribution of this vitamin among food materials are not at present warranted by the experimental data available.

Rickets

Rickets is a disease affecting young growing animals and is mainly characterized by a failure of the bones to calcify properly, a condition readily revealed by radiographic study. It may be induced experimentally by feeding rations ill-balanced with respect to calcium and phosphorus and deficient in the anti-rachitic vitamin. One symptom of rickets distinguishing it from other deficiency diseases is a greatly decreased content of phosphorus in inorganic combinations in the blood plasma. An interesting and highly important discovery relating to this disease is that sunlight, in particular the ultra-violet rays, may take the place of the antirachitic vitamin. A ration that will induce rickets in animals kept in the dark, will not produce rickets if the animals are kept in the light, or are exposed to direct sunlight even for 2 or 3 hours a day.

Chickens are undoubtedly subject to rickets. Probably some of the symptoms described above as being due to a deficiency of vitamin A, particularly the leg weakness, are symptoms of rickets resulting from a simultaneous deficiency of the antirachitic vitamin. If both fat-soluble vitamins are deficient in the ration, either rickets or the disease characterized by ophthalmia or both may occur. For example, ration of white corn and skim milk with certain mineral additions has been found to produce rickets, while a ration of white corn and tankage tends rather to the production of ophthalmia. Both rations are greatly deficient in fat-soluble vitamins and cannot support life for any great length of time. Birds on the first ration are distinctly benefited by exposure to light, while such exposure does not alleviate the condition of birds on the second ration.

Vitamin B

Vitamin B is a water-soluble vitamin, and like the fat-soluble vitamins, it is probably dual in nature. This vitamin is rather widely distributed in nature and in particular is fairly rich in all seeds. It is difficult to induce a deficiency disease due to lack of vitamin B in rations made up of natural foods. Milled cereals, such as patent white flour, degerminated corn meal, and polished rice, readily induce such a deficiency disease in all animals. This disease is characterized mainly by nervous symptoms due to nerve inflammation and degeneration. The syndrome is commonly called a polyneuritis, though some involvement of the lower centers is also indicated. The common symptoms of avian polyneuritis (polyneuritis columbarum) are loss of appetite, diarrhea, loss of weight, lowering of body temperature and respiratory rate, anemia, asthenia, and the nervous symptoms characterizing the disease. These

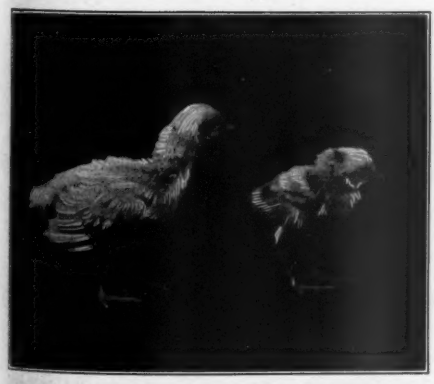
have been well described by McCarrison as follows: ".....weakness of the legs, tendency to stumble, inability to surmount small obstacles placed in their way, paresis of the legs or wings or both, paralysis, astasia, incoordination, cerebellar symptoms, and convulsive seizures." The evidences of cerebellar disorders are further described: "Every few moments or at longer intervals it is afflicted with convulsive seizures in which it turns 'cart-wheels' backwards, it may be for a distance of several yards; or it may pursue its beak round and round in a circle, its tottering limbs acting as the pivot on which it rotates." A retraction of the head in a position of extreme opisthotonus is also characteristic.

Postmortem Examination

In cockerels dying from polyneuritis the most notable finding is a marked atrophy of the testicles or a marked under-development. The testicles of afflicted birds may be less than a tenth their normal size. The ovaries of pullets suffer a like arrest of development though not to as marked a degree. Most of the organs and glands of the body exhibit a more or less marked atrophy. The suprarenal glands, however, show no such change and in relation to the body weight of the bird at death are greatly increased in size.

Cure and Preventive

The most reliable cure and preventive of this deficiency disease is the consumption of fresh green feed or dried yeast, especially brewer's yeast.



Lack of vitamin B. These chicks represent two groups that were fed the same diet with the exception that the chick on the right did not get the growth-promotion vitamin B. Note the contrast after feeding eleven days on the complete and deficient diets.

Under natural conditions of care and feeding poultry are not in any great danger of incurring polyneuritis. However, the requirement of poultry for vitamin B is probably much more intense than that of most other animals. In

Lack of antineuritic vitamin. Chicken fed on deficient diet suffering from polyneuritis.

fact, there is some suspicion that whole grains do not contain a sufficient concentration of vitamin B for poultry and that consequently, at times when green feed is not available, as for example during an extremely dry and hot summer, leg weakness may be induced by a deficiency of vitamin B in the ration. The administration of yeast under such conditions should be beneficial, though it must be remembered that infection by certain types of bacteria, notably *Bacillus suipestifer*, may produce symptoms closely simulating those of leg weakness and polyneuritis.

Vitamin C

Vitamin C is another water-soluble vitamin having a rather limited distribution among natural food products. It is associated with fresh green vegetation and is found in comparatively high concentration in the juice of citrus fruits and in tomato juice. Its absence in the diet of certain species of animals (man, monkey, and guinea pig) produces scurvy. Poultry, however, appear not to need vitamin C and not to be susceptible to this deficiency disease.

Importance of Vitamins

In the maintenance of health and normal development in the poultry flock the importance of vitamins is undoubtedly much greater than

the occurrence of deficiency diseases would indicate. It should be remembered that these are simply the end results of vitamin deficiencies. Long before the characteristic symptoms of deficiency appear, the bird may show signs of ill-health and malnutrition, if subsisting on rations only moderately deficient in their vitamin content. Impaired appetite, digestive disorder, diarrhea, colitis, low temperature, anemia, and general lack of vigor may be due to diets ill-balanced with respect to vitamins. McCarrison concludes from his extensive experience with the biological effects of vitamin-poor rations: "It is no doubt of great importance to be aware that food deficient in certain vitamins will ultimately cause nervous symptoms (for example) of a definite order. But since these are end results, it is of still greater importance to realize that the same faulty food will give rise more early to gastro-intestinal disturbance and other forms of vague ill-health, and that these, like the nervous symptoms, can be prevented by supplying the necessary vitamins and adjusting the balance of the food." In the same connection the possibility may be mentioned that a ration on the border line with respect to its vitamin content may become distinctly deficient in this respect if the flock is infected with intestinal parasites, since the parasites may rob their host of enough vitamin to induce distinct symptoms of deficiency disease. —Animal Pathology Exchange, University of Illinois.

TRANSMISSION OF CHOLERA FROM IMMUNIZED SWINE

The question has often been asked whether pigs receiving the simultaneous treatment would transmit cholera to susceptible animals. In my experience of sixteen years with anti-hog-cholera serum and virus, I cannot recall a single instance where pigs receiving the double treatment transmitted cholera to pigs which were not treated. I can recall a number of instances where one or more pigs broke out of the pen where we were treating and ate, drank, slept and went to market with the herd. I should like your opinion on the above subject. I believe there has been a great loss of hogs by the raisers waiting until they market a bunch of feeders or until pigs of a later farrow get large enough to immunize before treating those that are ready.—O. M. B.

Reply by Dr. Kinsley: It is usually conceded that if the simultaneous treatment does not produce a sufficient reaction that is manifested by the usual symptoms of hog cholera, then there is no danger of the elimination of the virus from the vaccinated pig. In other words, there is no danger in the transmission of cholera from simultaneously immunized swine unless the immunization produces cholera.

It is generally agreed that thousands of dollars could be saved to the swine breeders if they would have their swine immunized ten days or two weeks after weaning rather than waiting until cholera appears in the neighborhood or until the second farrow of pigs are large enough to be simultaneously treated.

ACHIEVEMENTS OF VETERINARIANS

I should like to have a list of the things the veterinary profession or individual veterinarians have given to the livestock industry and the world in general—F. F.

Reply by Dr. Merillat: First: the veterinary profession has kept pace with the evolution of medical science and in many instances has surpassed the achievements of the medical profession in the study of animal diseases. It has given the livestock industry the benefit of applying advanced medical science to the treatment of animals as fast as medical science progressed. It has never lagged behind.

Second: It has stabilized the livestock industry by controlling the scourges which otherwise have devastated it. It has enabled the livestock industry to get rid of blackleg, anthrax, rabies, hog cholera, rinderpest, pleuropneumonia of cattle, Texas fever, glanders and other diseases. If these diseases were rampant, as they would be without the work that veterinarians have done toward learning how to control them, the livestock industry of this country would probably be at a very low ebb, if it existed at all as an industry. If this is true, as everyone knows it is, the national welfare itself depends a great deal upon the work of the veterinary profession.

Third: It has kept pace with the advancement of surgery and applies modern surgical procedures to animals with results that parallel those of the human surgeon.

Fourth: The profession in this country must be credited with having kept many European animal scourges from our shores and of eradi-

cating one of the greatest of them on two different occasions (foot-and-mouth disease).

Fifth: The veterinary profession, by having discovered the cause of Texas fever, is gradually eradicating this disease from the South to the end that this section of the country is becoming a great livestock area after centuries of ill success in breeding. The veterinary profession is gradually eradicating tuberculosis from the cattle herds of this country. It is seriously studying and with apparent success, the terrible scourge of abortion disease and seems to be clarifying the situation in this connection with considerable rapidity.

Sixth: Individual veterinarians have discovered the micro-organism of anthrax of glanders, of Texas fever. It was the discovery of the micro-organism of Texas fever that gave the medical profession the first hint about insect carriers of disease, and this resulted in discovering the method of controlling yellow fever and malaria in humans. This credit goes to the U. S. Bureau of Animal Industry, undisputed. Dorset and Niles, American veterinarians, discovered the present method of immunizing hogs against hog cholera, and Maurice C. Hall, Senior Zoologist of the Bureau of Animal Industry, has discovered a treatment for hookworm disease in animals and man that has taken precedence over all other previous treatments (carbon tetrachlorid).

If space permitted, these achievements could be related to a voluminous extent.

A STUBBORN CASE OF MILK FEVER

I was called to a farm, about twelve miles away, where the farmer said he had a cow down that had calved two days before. On arriving at the place, I found the cow down in the usual position, temperature subnormal, stertorous breathing, udder empty—a case of milk fever sure.

I gave the regular routine treatment for the ailment, and in about an hour the cow raised her head, looked around and pricked up her ears. I told the farmer she would be up probably in an hour.

I went home and in about an hour or so the farmer said the cow got on her feet, began to eat and by morning seemed to be getting along all right. But in the afternoon, she began to get stupid and by night was down again. I was called again and gave the same treatment with the same result. The next evening she came down again, was given the same treatment and made a nice recovery. She is now giving a fine flow of milk.

This is the first cow I have encountered in my practice that had these attacks of milk fever three days in succession. This animal had been on full feed with the steers and was very fat.

Kensington, Kansas W. N. Hobbs, D. V. S.

MUSINGS FROM THE OLE NORTH STATE

Last evening while idly looking over the February number, I came to page 146 and "Musings from Ole Virginia." The following will explain why I feel impelled to contribute "Musings from the Ole North State."

One morning this week a prominent young physician and one of his relatives came to my office with a terrible tale as to how their best dog was about to die, and in the face of all that had been done, did I think I could do him any good? I went along to see the dog, a fine English Setter, and found distemper in all forms, i. e., catarrhal, intestinal and pleural, temperature 105.4, respiration labored and painful, and the patient so weak that he staggered as he tried to walk around the garage in which he was quartered, the walls of which were literally sprayed in places where he had defecated or rather he had squirted.

On inquiry I learned that the dog had been sick for a week or ten days and had been treated with a little bit of most everything, and now that he was about to die, could I save him? Their friend, the druggist, who also had taken a hand in the case, had wired Squibb for distemper serum, but upon inquiring around and comparing notes, it was found that another relative of the family, a dentist, already had some of Mulford's, but in their tribulation they did not know just how to dose in such a very serious case, and besides, as the physician repeated in my hearing, he did not have any faith in the stuff anyhow as he had used it all along last summer several times—the bacterin too, and then he had lost four fine pups.

Now, to finish the case and then I'll go on with my musings. I told them that I would use their serums but that I had some prepared by a strictly veterinary house which I could vouch for. This together with salol and some of Dr. Brumley's prescriptions has put the patient on a fair road to recovery.

Now as I "muse," I am convinced that the sale of biological preparations outside of the profession is a direct blow to the veterinarian,

to the preparation itself and also to the house which makes that sale. The veterinarian is hurt in that his services are not required. The preparation loses its reputation if improperly exhibited—need I direct your thoughts toward anti-hog-cholera serum and virus? And in this same way too the house loses in that its products are discredited. Also in this sense the veterinarian is not called because "he can't do nothin' anyhow but use that serum and it's no good, because I've tried it myself." The house further loses in that any veterinarian who has any pride in himself or in his profession should absolutely be ashamed of himself for patronizing any such house. Therefore, there is a loss three ways, and wherein lies any good except it may be in a few isolated cases? Consequently, such sales are not right and should be discouraged and those houses that continue this practice discredited by all veterinarians and veterinary associations.

Some little time ago, we had a terrible fuss pro and con, but mostly "con," about a certain veterinary supply house concerning their policy of selling to the laity. Now the only difference that I can see between selling to a druggist and to a layman, is that selling to the layman is the lesser of the two evils, for without the druggist to talk, exploit and advertise, a whole lot of people would never hear of a lot of things. For some time, I have not noticed any advertising in our leading veterinary magazines of the supply house previously mentioned. I believe that the A. V. M. A. decided that it was not ethical for such magazines to carry any advertisements of a house advocating any such sales policy as that of selling to laymen. But as I have just stated, there are houses that do an equally unethical act, carrying with it a far greater potency for harm to veterinary medicine and to the profession itself.

If it is not ethical to carry one bad advertisement, it is certainly not ethical to carry a worse one. It might be that if the matter were forcibly put to these houses by our national organization and by our leading papers, the trouble could be remedied, and if not, well, sometimes heroic measures are necessary to abort a condition.

I am not really so violent that I believe we should have everything, as it were, cut and dried for us, but I do believe, when we see a practice that is impoverishing us individually, discrediting those scientists who worked, often without pay, months and even years to discover a serum or vaccine, and which practice is also undermining and discountenancing our very profession and ourselves as professional men, then, I say, let us remove that practice by any and by all means.

Washington, N. C. John M. Kerr.

THE COST OF VETERINARY SUPPLIES AND BIOLOGICS

During these times when we read and hear so much about the depressed conditions in rural localities, it tends to make one look deeper than the surface for some of the causes. The one thing most striking to me is the disproportion of value between raw products and the price the consumers have to pay for their necessities. Cannot this proportion be brought nearer together? I am positive it can, in many cases at least. There are too many cases of a selected few profiting at the expense of the consumers.

Veterinary supplies constitute no exception to this general rule. We are paying too much for our veterinary products. Perhaps the most striking instance is where distributors of these products receive from 20% to 40% because of their location or influence. They do not in any way tend toward economy. They use that much abused term "service," when in reality there is nothing to it. Let some reliable firm cut out its distributors and give the practitioner 75% of the discount given the distributor, and see how long it will be before the rest are following or quitting the business.

For example, a firm in St. Paul will have its distributors in Kansas City or Chicago. Chicago or Kansas City firms have distributors in St. Paul and other cities. I ask, is there any reason for the distributor? Is it true economy or must we pay the extra because of a combine? I should not care if they were using the extra profits for research work that would improve our general status and save more for our clients.

Imagine sending in an order for $20.00 worth of biologics and a distributor receiving about $8.00 for filling that order. If that isn't donating, then my brains are running backward.

That old saying: "You can fool some of the people all of the time and all of the people some of the time but not all of the people all the time," is very true. The sentiment among practitioners is becoming quite strong against the business principles of many houses.

Unless these houses change some of their business principles soon, they will see the prac-

ticing members of the state associations banding together, and manufacturing biologics and other preparations themselves. If not this particular method, then there will be some alternative.

They generally say, "Why should you care? You can charge it to the farmer." That's what other business organizations are doing, and the sum total of it all is responsible for much of the depressed conditions in rural districts that indirectly are putting some veterinarians out of business.

Foley, Minn. Joseph X. Parent, D.V.M.

ANIMAL PARASITES

I am of the opinion that many practitioners, and in many cases those associated with small animal work, are a bit stale in their helminthology. A certain well-known veterinarian located in a large central western city told me a short time ago that he had often heard other veterinarians speak of a certain well-known helminth but he had never seen it.

So many dogs are sent to our hospital from elsewhere and so many tourists come here from quite distant points with dogs suffering from rather common parasitic conditions previously diagnosed as metallic poisoning, etc., that I think some of the "classical cases of helminthism" are common elsewhere but the doctors don't seem to "expect them."

The so-called heart worm, filaria immitis, is thought by some to exist in certain parts of the country. I have seen it in so many sections of this country and of other countries that I would not be surprised to see or hear of it any place regardless of climatic or other conditions. Hookworm is a common offender that is overlooked, and often blamed for lots of crimes of which it is not guilty.

While on these two parasites, it may not be out of place to say that I have found monkeys here in Audubon Park Zoo affected with both, I believe. The hookworms I identified all right. The worms, five in number, that either were or greatly simulated the filaria immitis were discovered interwound through the omentum of a large monkey that was found dead by the keeper one morning in one of the monkey houses.

We had a young jaguar found dead one day, and on postmortem examination discovered the right ventricle filled with these worms. We have trouble with all zoo animals because of worms as a matter of fact. Two apparently well seals were received a short time ago, ate well and acted frisky. They were found dead after a few days of friskiness and postmortem examination showed pathological changes that had been existent for a long time. In this instance, it was a case of acariasis.

Postmortem examinations are good instructors.

New Orleans, La. W. J. Ratigan, V. M. D.

ANAPHYLAXIS FROM HYPODERMA LARVAE

I read with considerable interest the article "Anaphylaxis from Hypoderma Larvae" by Dr. J. G. Jervis of Milner, B. C., in the January issue, because within the last few months I have been called to treat three cases affected with identically the same symptoms as those described by Dr. Jervis.

In August, 1923 I was called to see a five-year-old grade cow. She had marked enlargement of the lips and eyelids. The udder was swollen and hard, vulva and anus swollen and shiny. She breathed with difficulty and drooled saliva freely. Temperature 102. Although I have been in veterinary practice for thirty-two years, this was the first case of its kind I had ever seen.

I injected 2 c.c. of hemorrhagic septicemia bacterin and went home as it was late at night. The owner telephoned the next morning to say his cow was O. K.

On February 11th this year, I had my second case—a registered Holstein heifer, three years old. Her symptoms were the same as in the other case, with a temperature of 103. I gave the same treatment with the same result.

On February 14th, the owner of an Angus cow, five years old, telephoned me to come at once as his cow was choking on an ear of corn. In my haste I took nothing with me but a probang and mouth speculum. Upon my arrival I found this cow affected the same as the other two, but on account of the difficulty the animal showed in breathing, the farmer was sure she had something in her throat. So to satify him I passed the probang. I gave no medicine. And the cow was all right the next day.

These are the only cases of their kind that have come within my notice as a practitioner, and I should certainly like to know more about this strange malady.

Cresco, Ia. P. G. Button

FATAL CASE OF RABIES

The following clipping from a local paper is the third report of human rabies which proved fatal in spite of Pasteur treatment.

"Carmine Minichini, a laborer, died at the City Hospital, Newark, February 10th from hydrophobia. He had received the Pasteur treatment last August after he was bitten by a pet dog.

"When his illness was diagnosed February 5th as hydrophobia, a male nurse offered him a drink of water. Minichini declared it was 'poison' and when he saw that the nurse himself failed to drink it, he jumped out of bed and attacked four women nurses and two male attendants, escaped from the hospital and ran to his home at 496 Bloomfield Avenue. Five policemen captured him and took him to the City Hospital."

In each of the three cases other people were bitten and were given the Pasteur treatment and are in good health at present.

Hackensack, N. J. I. Rubenfeld.

AN EVERYDAY LINIMENT

In these piping days of peace, when every dollar equals one hundred cents to the practitioner, the following liniment will be found extremely useful, and the cost will be the most pleasant part of the making:

In a one gallon bottle put two ounces stronger ammonia; add one pint lukewarm water, and shake well. Add four ounces oleic acid, and give the bottle another osteopathic treatment, and pour in another pint warm water. Dissolve four level tablespoonfuls ammonium chlorid in a pint of warm aquae pumpus, and add this to the mixture in the gallon bottle. Take the bottle in your hands and shake like a poodle pup with a bad case of chorea. Now mix in four ounces methyl salicylate, and another pint of water, and agitate once more. Finally, add twelve ounces turpentine, fill the bottle up with warm water and shake well. Let stand about a week, giving the bottle a good shake every day, and you will have a beautiful cream liniment, that you can use for almost every purpose from a sore shoulder to mammitis. It may be made a delicate pink or sea green, if one wants to keep it distinct from other medicines.

I find that if I keep one bottle on hand "ripening," the longer it stands the better it gets. One can make it stronger or weaker with more or less turpentine, but the above quantities will be found to give good satisfaction. Rubbing this over the spinal column of a milk fever case seems to add to other stimulants.

Unless one adds each ingredient just the correct way, and mixes the warm water well, he will find he has a very sickly looking mess that separates quicker than a millionaire couple in Reno.

Moscow, Idaho. E. T. Baker

TETANUS IN A DOG

In September 1923 a white Spaniel bitch was shipped from a neighboring town to be spayed. I spayed her and shipped her home in a clean box the next day. About two weeks later, the owner phoned me, saying that the bitch was slobbering at the mouth. I advised a laxative pill.

A few days later he telephoned me again that the bitch was worse and that he was returning her by train. When she arrived I found her flat on her side in a box and unable to rise, her jaws set tight with tetanus. This was the first case of tetanus I had undertaken to treat in a dog.

I had a bottle of antitetanic equine serum and gave the animal 7 cc. hypodermically. The next morning and evening I gave 5 cc. and continued that for two days. On the third day she could lick milk with difficulty. I reduced the serum to 5 cc. once per day for another few days. The bitch made a good recovery and was shipped home at the end of ten days.

Owen Sound. Ontario. R. J. Norton.

MILK GOATS

I am very much pleased to note the interest shown in the milk goat. These are wonderful little milk producers, and their product is a sure enough "superior milk." They are the cleanest and most healthy of all milk producing animals, practically free from tuberculosis, and I don't believe there ever has been a case of Malta fever in milk goats in Texas.

If I am correctly informed, Malta fever is a disease of the inhabitants of the island of Malta brought about by insanitary conditions existing there, some goats taking it from the people and some appearing to be just carriers of the disease.

An article in the January issue of VETERINARY MEDICINE stated that if there was any possibility of Malta fever existing in a locality, the sale of goat's milk should be prohibited. Do they prohibit the sale of cow's milk on account of tuberculosis? Let's be fair to

the goat. It is making considerable new business for the veterinarian.

Every baby or invalid that has taken milk from my goats has been greatly benefited or entirely relieved of their trouble, or call it "cured" if you like.

San Antonio, Texas C. Rager

TREATMENT OF CANINE DISTEMPER

I will endeavor to give my latest methods of treating canine distemper, in which I have obtained very good results from Numoquin Base (Merck's). The method of administering the medicine is as follows:

Dogs under ten pounds should receive 2½ grains of the Numoquin Base every six hours until the animal has received 18 doses.

Dogs over ten pounds should receive five grains every six hours until the animal has received 18 doses.

Numoquin Base comes in a powder and is filled in gelatin capsules of the sizes stated above.

Diet: After giving the medicine, nothing but sweet milk with lime water should be given the animal after each dose of medicine, and the amount should be as follows: Dogs under ten pounds, one-half pint; dogs over ten pounds, one pint after each dose of medicine.

Diet No. 2: The dog should be fed every three hours small amounts at each time of fresh cold beef and raw eggs.

Medicinal treatment: Give to small dogs 5 minims of Haarlem oil three times each day for three days. Large dogs should receive ten minims three times each day. Beginning on the ninth day, use egg cod liver oil emulsion, giving small dogs one-half tablespoonful three times each day; to large dogs give one tablespoonful three times each day. After this treatment, place the dog on a good general tonic.

Medicated baths: Dogs should be given a lukewarm bath every day and then thoroughly dried. Use one ounce of Pine-O-Pine to ten gallons of water.

Steaming the dog: In case there is difficult breathing, I have used the following method to relieve the condition. Take one pint of boiling water; heat a large sized iron bolt red hot and place in the water; then place the cup in a size 12 or 16 paper bag and hold the dog's head over the bag for fifteen minutes. Repeat this until results have been obtained.

Do not use Numoquin Hydrochlorid.

John A. Phillips, D. V. M.

Houston, Texas. City Veterinarian.

URINARY TROUBLE IN A GELDING

I was called to treat an eight-year gelding which appeared to be in fine condition. But on closer examination, it was found to be troubled with a dribbling of urine when put in motion.

The temperature was normal, also the pulse. I suspected a calculus formation in the bladder, but on rectal examination, I found the bladder to be very hard. It was encircled with rib-like formations about as thick as an ordinary lead pencil and pointed at the apex. Pressure on the bladder would cause the horse to strain and pass a small amount of urine.

This horse has been idle for several months, has had soft feed, warm quarters and has been well blanketed. I have given the following treatment: hexamethylenamin, two drams, twice daily combined with sodii bicarbonas and potassium nitrate. The condition has been relieved somewhat but there is no permanent improvement. The history appears to indicate a chronic condition.

I should greatly appreciate it if anyone could give me some enlightenment on the case with suggestions as to a line of treatment that might be successful.—J. H. W.

OPERATION ON CROSS-EYED BULL

A client of mine has a very valuable yearling bull which if sound would be shown at state fairs, but the animal is very badly cross-eyed; the eyes turn in so badly that it bothers him to see. Could this condition be corrected by an operation?

Reply by Dr. E. L. Quitman: It is possible to correct this condition surgically, the technic of the operation being as follows:

The eye should be anesthetized by the subconjunctival injection of cocain or novocain dissolved in 1-1000 solution of adrenalin chlorid, using a sufficient amount of the drug to make a four per cent solution. The injection should be made at the point to be operated upon. If the animal is very nervous and restless, general anesthesia is advisable. The following instruments are required: Eye speculum, blunt pointed scissors, straight or curved on the flat (Mayo pattern is best), serrated fixation forceps and two strabismus hooks.

In convergent squint such as you describe, the tendon of the internal rectus should be divided close to its insertion into the sclerotic. If the eye is also retracted upwards or downwards, it may be necessary in a subsequent operation to sever the tendon of the superior or inferior oblique muscle, whichever is at

fault in unduly putting the eye upward or downward.

The conjunctival membrane over the muscle to be divided is pinched up with the fixation forceps, either in a vertical or horizontal direction, and divided with the scissors, so that a conjunctival wound taking the direction of the width or length of the muscle remains. The capsule is penetrated below the tendon and then a strabismus hook is introduced and passed by a sweeping movement under the tendon which is drawn forward, and either it or the muscular substance is divided with the scissors. The second hook is used for searching for any small strands of tendon or muscle that may have escaped division. Incomplete division of the tendon or the muscle would nullify the object of the operation. The conjunctival wound can either be sutured or left alone.

This operation (strabotomy) acts by allowing the divided muscle to become adherent to a spot more posteriorly situated on the sclera.

HORSE KILLED BY LIGHTNING

In the summer of 1920 I was called to see a horse, and upon examination I pronounced the condition as swamp fever. The owner said I was wrong and that he was positive that the horse was hit by lightning, "but not hard enough to kill." The following summer, the horse died, and the farmer having his buildings and livestock insured against fire, lightning and tornado, called the insurance agent to see the dead horse. The agent agreed with the farmer that the horse had again been struck by lightning and that this time it was killed. The farmer received $200 from the insurance company for the loss of the horse. I was not present on this visit of the insurance agent.

Later I had occasion to meet the agent on claims relative to another case, and we discussed the past incident. He stated that the insurance company had given him certain information by which he could determine if an animal is killed by lightning, and according to that, a horse killed by lightning will show a small "burnt spot" on the under side of the hoof of one limb. This is where the lightning is supposed to have passed. In the case referred to, the agent had found the "spot" and thus his decision. He also stated that a burnt or burning match applied in a certain manner will give a simliar "spot." He was positive that the horse was killed by lightning. I was not shown the printed information issued by the insurance company but was told it was as he had stated. This is something new to me and it will take more than one insurance agent to give me a technical decision on it.

Ely, Minn. J. E. Thompson.

Comment by Dr. Merillat: The postmortem findings on carcasses of animals killed by lightning are limited to burns and traumatisms at the point the electric current struck and along the course it took over the body. This is generally found to be in the form of a subcutaneous hemorrhage. There are no internal lesions. When the shock is indirect, as for example when an animal stands near a tree that is struck by lightning, there are no lesions whatever to be found postmortem.

SPASM OF THE GLOTTIS

I have a horse under my care, five years old, in good condition, used in general farm work, that is showing the following symptoms: sudden attacks of severe dyspnea with laryngeal stridor in both phases of respiration, seeming to be air hungry; dilatation of nostrils, open mouth, anxious expression. Attacks last a couple of minutes, then disappear or recur as the case may be. I have pronounced it spasm of the glottis. Can you tell me what I have and outline a treatment?—H. E. A.

Reply by Dr. Merillat: You diagnosed the case well enough. I know of no better name than that of spasm of the glottis. It is my experience that all of these cases of spasm are due to laryngeal insufficiency, incident to a damaged recurrent laryngeal nerve, and sooner or later they manifest themselves as real chronic cases of roaring, the severity of which will depend upon the extent of the permanent damage the nerve has sustained.

With regard to treatment, it would be advisable to keep the animal in good muscular condition without any tendency towards obesity and to administer iodid of potassium internally. I used to think years ago, and I have not entirely changed my mind, that daily injections of tincture of capsicum, diluted to one-half strength with water, injected directly into the throat with a syringe, has a beneficial effect in helping to improve new cases of roaring. That is to say, when a horse begins to show roaring following a serious illness, we thought that this treatment sometimes cured or at least prevented the animal from becoming a worthless

roarer. I shall not try to explain the philosophy of this treatment, although it might be defended on the grounds that it excites peripheral nerve activity by its irritating effects.

STERCOREMIA IN SHEEP

My attention was recently called to a bunch of about 200 sheep. Fifteen had died and several were sick. The following are the symptoms and postmortem lesions as nearly as I can describe them.

The sheep first begin to look back and lose their appetite. Next in most of them a diarrhea begins, and the animals go down and die in a few days. Some live a week or two, and some have gotten better and are eating a little again. Several went blind, the eyes turning white and looking about the same as a cow with pink eye.

I conducted postmortem examination on three or four, and the principal lesions I found were in the bowels, which were studded with patches from the size of a match head to ½ inch in diameter in the shape of a nodule or a lump. When incised these nodules discharged a mass of caseous pus. All seemed to be about the same .

It seems to be affecting the younger ewes of the bunch.

If you could assist me in a diagnosis from this meager description and give some advice as to treatment, I should be very thankful. At present I am giving intestinal antiseptics. —P. T. F.

Reply by Dr. E. T. Baker

One can mostly figure on dietary troubles this time of year. Pregnant ewes will frequently do without water as the cold liquid seems to give them a lamb colic. This obstipation (or stercoremia) leads on to almost every symptom known.

I like to take the temperature, and if it is around 104, figure on constipation; if around 106 or higher, hemorrhagic septicemia may be suggested. A laboratory examination, if at all possible, helps often to clear up the clinical symptoms.

Treatment, which is far the most important from our standpoint, consists in giving the ewes whole oats and bran, bright hay free from mold, plenty of salt, and water with the chill taken off. Your treatment of intestinal antiseptics can be further aided by hypos of camphorated oil, and mixed ovine infection bacterin.

For the ewes down and unable to get up, about 150% die, and the ones merely staggering around about 80% mortality. The most pleasing results in practice come from practical suggestions on prevention, and when these are successful, the practitioner makes a friend.

PURULENT PNEUMONIA IN CALVES

These cases were investigated on a farm near St. Mary's, Ontario. The owner reported that three out of five calves which were being raised in the same pen had died within a short time of each other. The remaining two were also sick.

The breathing was rapid, accompanied by a frequent depressed cough. They had no appetite for food and showed marked debility. The temperature varied from 102 degrees to 105 degrees F. The disease lasted several weeks before terminating fatally.

On post mortem, the anterior and inferior parts of the lungs were almost solid, grayish red in color and sprinkled with numerous abscesses, large and small. The bronchi were full of a purulent discharge. Empyema was present in one case. Several ulcers were present in the small intestines.

Diagnosis: purulent pneumonia.

Bacteriological examination was made and a pure culture of a small Gram-negative bacillus was obtained from both of the cases examined.

The infection seemed to have been introduced by a recently purchased cow. Her calf was weak at the time of birth and developed the disease which later spread to the other calves with fatal results.—Report of Ontario Veterinary College, 1923.

NASAL CATARRH AMONG FOWLS

These cases were investigated on a farm near Paris, Ontario. The owner reported that several valuable birds had died and a large number were sick in a flock of four hundred Rhode Island Reds. An investigation was asked for and made.

The affected birds had a catarrhal discharge from the nose and eyes. They were being kept housed closely under unsanitary slum conditions.

The owner was advised to improve the general conditions under which the birds were kept. For treatment the flock was given Epsom salts, two pounds per hundred birds, together with potassium permanganate added to the drinking water.—Report of Ontario Veterinary College, 1923.

ACUTE SEPTICEMIA AND PNEUMONIA IN YOUNG PIGS

During the latter part of the winter several reports came to the college of excessive losses among young pigs. The uniformity of the symptoms described indicated a common type of infection. In some respects the disease resembled enzootic pig pneumonia. Several young pigs died at the Ontario Agricultural College piggery with symptoms similar to those reported elsewhere.

In all cases the appetite was poor, the abdomen was tucked up and the hair rough. A cough was constantly present. As the disease progressed, the breathing became more and more labored and rapid, resembling the so-called "thumps." In some cases the disease was very acute, the animal being apparently well in the morning and would die before night time. Diarrhea was present in many cases. On damp cold days the symptoms were more pronounced. Pigs between the ages of three to six weeks were chiefly affected. Necrotic stomatitis or sores affecting the mouth were frequently present.

Examination of dead pigs revealed a marked variation in the appearance according to the type of the disease. In the most acute cases, minor changes alone could be discovered. Areas of congestion in the lungs were constant, but the visible changes did not seem pronounced enough to account for the rapidly fatal nature of the disease. In the sub-acute and chronic forms of the disease, marked changes were observed. A broncho-pneumonia involving the anterior part of the lung was commonly present. A sero-fibrinous pleurisy frequently accompanied the pneumonia. Pericarditis or inflammation of the covering of the heart was sometimes present. The liver was usually congested as were also the mesenteric vessels. Peritonitis was well marked in some cases. Pink blotches were seen in a few cases in the regions of the thighs, inferior maxillary space and flanks. The lymph glands, other than the cervical and pectoral glands, were usually normal. There was frequently marked evidence of nasal catarrh. This with the inflammatory condition of the cervical and prepectoral lymph glands would indicate the line of infection.

Several organisms were isolated, including the Bacillus suisepticus, Bacillus pyogenes suis, and a diplococcus. No single organism was constantly present.

Sections made from the lung in chronic cases showed a typical broncho-pneumonia with pleurisy. In the acute cases the lung tissue was very congested with slight cellular infiltration of the alveoli. The liver showed areas of degeneration.

The acute forms presented the clinical picture of a septicemia. The chronic type could be considered as broncho-pneumonia with secondary pleurisy, presenting the clinical picture of enzootic pig pneumonia.

In cases where this disease appears, the sick pigs should be removed from the others. All of the young pigs should be made comfortable and kept in a warm dry place. The breeding of the sows should be regulated to prevent as far as possible their farrowing during the cold winter months. Sows which are due to farrow should be placed in a special pen which has been previously cleaned and disinfected. The brood sow and her new-born should be kept warm and dry and protected from exposure to cold and damp which lower their resistance and render them more liable to infections that they otherwise might withstand. This disease is only likely to become epizootic under certain seasonal conditions which encourage the infection in the same manner as influenza outbreaks occur among people.—Report of Ontario Veterinary College, 1923.

ACID TREATMENT OF HERNIA

Several months ago I noticed an article in the journal on the treatment of umbilical hernia with, I believe, nitric acid, which was to be painted over the surface of the enlargement. I have a case in a very valuable yearling that had a large hernia. I operated during the past fall, using the clamp method. The opening was the size of a half dollar and the hernia proper the size of an orange. The opening has reduced in size somewhat and the hernia to the size of a walnut with some little adhesion present. The owner would like to obliterate the enlargement entirely but doesn't want to take chances on a radical operation. The thought occurred to me that the acid treatment might work and so I sugested it to the owner, stating I would investigate it and try to get the modus operandi from someone who knew about it.

I shall appreciate any information that you might give me on the subject.—F. A. W.

Reply by Editor: We cannot believe that the nitric acid treatment would be effective in the case of the umbilical hernia mentioned. This treatment consists of painting the skin over the hernia lightly with nitric acid. It is not nearly

so safe a procedure to my way of thinking as an operation, for the reason that while the intention is to cause a considerable swelling of the part and thus close the hernia opening, occasionally there is a great sloughing of the tissue, which may lead to serious trouble, and in still other cases, so little swelling results that no benefit is derived from it. In other words, either the strength of the acid that we are able to get varies, or the tolerance of the skin in different colts varies enormously. The treatment would certainly fail where the herniaed portion is adherent to the skin as seems to be the case in the colt you describe. To my way of thinking, the radical operation is the thing for this colt. It will not be necessary to open the abdominal cavity, I presume, and I should not regard it, even if that were necessary, as a very serious operation.

COMMON HORSE SENSE

1. Kindness is the best policy. Far better results are obtained from animals by kindness than by rough treatment. Nearly all bad horses are made so by brutal treatment.

2. Horses and mules are animals, not machines. They have feelings just as we have and should be treated with consideration.

3. Horses are strong if properly cared for. They cannot care for themselves. If we neglect them they suffer and we lose their service.

4. An animal is no stronger than his weakest part. It will avail us nothing for him to have wonderful muscles and poor feet. Every part must be cared for.

5. The human voice has great effect on animals. They read our emotions by the tone. We can increase our control 50% by using the voice. Contract the habit of talking to your animals; they understand more than you think.

6. Always speak on approaching an animal to attract his attention, so that you will not startle him.

7. Horses and mules are naturally timid. Gain their confidence and respect by gentleness, patience and persistence.

8. Never punish an animal in anger. It would be only satisfying your own brutal instinct. Most faults committed by them are through lack of understanding or fear, seldom through viciousness. If punishment is necessary, it must follow the offense immediately and then be commensurate with the offense.

9. Reward gains far more for us than punishment. In training, always reward a correct performance, no matter how slight. It is our only means for telling him "well done."

10. Every animal is an individual and must be studied and treated according to his needs. There is no greater mistake than treating them like so many biscuits in a pan.

11. Feed animals so that they may get the best value from their rations. You want it from yours. Feed clean food, properly prepared, frequently, and in small quantities.

12. Feed animals so that it will not injure them. Never when they are heated.

13. Water animals rationally. They should have all they want to drink. Never water when heated unless the exercise is to continue immediately. Never immediately after feeding; wait an hour. Before feeding is the best time.

C. E. Jewel, Lieut. Col. V.C. (Retired)

14. Work animals rationally; never to exhaustion. If hard work is to be expected, have them in condition to perform it.

15. Keep animals well by proper care; don't wait until they become sick and cure them. Prevent sickness, and cures will be unnecessary.

16. Give animals clean stalls and clean beds. They will be healthier, rest better and serve you better.

17. Save them from exposure by proper shelter. They will last longer and require less food.

C. E. Jewel,
Lieut. Col., V. C. (Retired).

FITS IN HOGS

I have had trouble with this for the last three years but only in fall pigs. There is a stagnant pool on this farm that goes dry the latter part of summer, and the sows spend a lot of time rolling and lying around in the black mud.

The animals are thrifty and have a glossy coat. They seem to be attacked one at a time. There is no cough; the temperature is normal; bowels normal. There is a very rapid difficult breathing when the animal comes in to feed. They go into convulsions after drinking a few swallows of slop or with an ear of corn in their mouths. If they are left alone in this stage, they will die in a few minutes, but if given very brisk chiropractic treatments, will revive again.

On postmortem examination I have found worms in some but not in others. What is the trouble?—O.O.O.

Reply: The foregoing case report is interesting and has been reported in detail, hoping that some further information may be obtained. The condition described is unusual, possibly because the occurrence and termination of the disease is atypical. The following excerpts from "Swine Practice" (Kinsley) on epilepsy are of interest.

"Epilepsy is a functional disorder and may be the result of a variety of causes. Parasitic infestation of the digestive tract is a common cause of this disorder, particularly in young pigs. Invasion of the brain with echinococcus is sometimes responsible for attacks of epilepsy. Auto-intoxication is probably an important factor in some cases of epilepsy. Cut hair or other concrements are frequently found in the stomach of swine that have had attacks of epilepsy. There is apparently some relationship between the sexual function and epilepsy as attacks sometimes occur in young boars at the age of puberty and in gilts during the estrual period.

"The attack may be sudden, especially in young pigs. They may come to the feed trough, eat a few mouthfuls, back up, fall over, lose consciousness and lie kicking and champing their jaws. The affected pig soon gets up, moves about with an uncertain gait, has staring eyes but soon regains consciousness and although there may be some indication of weakness is otherwise normal. There may also be defecation, urination, and discharge of semen. The seizures are of short duration, rarely exceeding five minutes. The attacks may occur in rapid succession, or considerable time may elapse between attacks."

According to the report, fall pigs only are affected and the exact significance of this may be a factor in solving the problem. From the report, it is also evident that the affected animals are prone to die during an attack. The occurrence of the disease in fall pigs only and the percent of fatality during the attacks are practically the only factors against a diagnosis of epilepsy.

It is possible that the disease is atypical epilepsy. The treament in such cases is usually not successful but we would suggest that the future pig crops be protected against the wallow and parasitic infection. Veterinary Medicine will be pleased to have comments from readers on this interesting report.—A. T. K.

EXCESSIVE DOSE OF CARBON TETRACHLORID INJURIOUS

I gave a pointer pup one-half ounce of carbon tetrachlorid some time ago. The next day he was sick, so gave a dose of castor oil. This straightened the pup up for a few days, but he again went off feed, took diarrhea and became very thin.

I gave him another castor oil physic and followed with cod liver oil. The pup straightened up again, but stays poor and goes off feed; vomition and slight cough. Have put him on a milk diet, then on cornmeal and meat mixed. He will relish a different food for a few days and then become sick.

This is a good pointer pup and I should appreciate some help on treatment. I suppose the stomach has been weakened and that liver trouble (diarrhea) has resulted from the worm expeller.

The dog is kept in an office building and basement in the city—not much exercise or fresh air.—V. C., Wis.

Comment: The dose was excessive. Hall recommends three-tenths c.c. per kilo of body weight, or 3 c.c. for a 22-pound dog.

HORSE PRACTICE

I am glad to see the way the journal is whacking away at horse practice. The veterinarian, if he has the right stuff in him, can do much to increase his practice and hold it. While we have a large cattle practice here, still I never miss an opportunity to root for the horse and to show that my interest is sincere, I take part in and contribute financially to everything that encourages it.

The horse practice is gone in some places, but twenty-two years ago when I came to this location, the veterinarian here told me that there was no horse practice here, that it was

gone and that it had been good in years past but no more. As a matter of fact, it has always been good with us and never better than it is now.

But I repeat, I am behind every movement that keeps it popular. It does not matter how much money it costs or how much time it takes. They know they can count on me. I feel this side of it very keenly, and I deplore the fact that more of our young veterinarians are not enthusiastic horsemen. I mean in certain localities, and there are certain localities suffering for that kind of a veterinarian right now. I could name half a dozen of them.

In other words, it is getting so now that the horse practice is overlooked, the same as cattle practice was until five or six years ago. If you went into a farming community then and talked cattle, they would say that their veterinarian did not know anything about cattle; he just knew about horses. We will have to watch out or pretty soon we won't have any veterinarians that know anything about horses.

Goshen, N. Y. J. F. DeVine.

Dr. J. F. DeVine, Goshen, N. Y., and his prize mount, Shooting Star, the winner of 12 blue ribbons in America and England.

ACTINOMYCOSIS IN A COW

I was recently called to attend a dairy cow that has a bad swelling on the right upper jaw which has been discharging pus for probably two months. I diagnosed the case as actinomycosis. The cow is in a very emaciated condition, appetite poor, and altogether a very poor prospect. However, the owner considers her a very valuable cow and wants her treated.

I started giving two drams per day of potassium iodid with Lugol's solution as a topical dressing and to inject into the ulcer. At the end of the first week, the cow showed marked symptoms of iodism, and I discontinued the use of the iodid and prescribed Fowler's solution and tincture of nux, equal parts, one-half ounce twice daily during the suspension of the iodid. In about a week, I shall again start the iodid.

What in your opinion are the chances for recovery after a case has gone so long without treatment? Can you suggest any better line of treatment or any adjuvant? If the ulcer is not actinomycosis, what could it be and will this line of treatment help or cure it? The ulcer has extended up into the eye and is causing a lot of suffering. Should the ulcer be opened further inasmuch as it is discharging freely?—B.T.H.

Reply by Dr. DeVine

I believe both your diagnosis and treatment are all right. Whether or not you should interfere more surgically will have to be determined largely by yourself. General opinion is that you should open up the fistula and curette every bit of dead bone and diseased tissue out that you can. If the cavity is not too large, packing it with an ointment of one part of biniodid of mercury with eight parts of base, may work well, creating a slough in a few days and leaving a clean open wound, which may be treated with tincture of iodin.

As to the question of whether or not the case will respond to treatment, it depends a good bit upon how much tissue is involved and how deep the fistula is. The simple fact that it is two months standing would not preclude recovery at all. We frequently see cases that have been neglected for six months or a year and recover with surgical interference and iodid of potash treatment. Repeat your iodin treatment at intervals as you have outlined until the wound has entirely dried up and has the appearance of being healed.

IDENTIFYING THE ABORTION BACILLUS

We have a client who has three cows which he suspects have contagious abortion and he asked us to determine whether such was the case. We obtained from the local municipal bacteriological laboratory test tubes with culture media and swabs and took separate material from the vagina of each cow. This was turned over to the laboratory for examination, and they report that an organism similar to the Bang bacillus was found but that they could not positively identify it as such since they lack suitable information on the subject from a veterinary standpoint.

My bacteriology does not give sufficient information, and they requested that I try to obtain information as to the best plan they should follow in order to determine the presence or absence of this bacillus.—A. J. S.

Reply by Dr. DeVine

I am enclosing a brief reprint covering the present knowledge on abortion disease. Most of the information in this pamphlet is based on investigations by Dr. C. E. Schroeder of the government experiment station. You will note that the Bang organism is not constantly recoverable from the vagina even though animals may be infected. In most cases, the organisms are not found in the vaginal discharge for any great length of time even after an animal aborts.

The best method known today for determining the presence or absence of Bang infection is by having the blood tested. Have your laboratories furnish you with sterile tubes or bottles to draw a little blood from each cow and have them make an agglutination or complement fixation test. Either test is quite reliable, but workers seem pretty much agreed that if both tests are applied, the percentage of accuracy in some cases is still higher than if one test alone is used.

DRESSING FOR NECK AND SHOULDER EXCORIATIONS

The best stock powder I have ever used in a horse practice for ordinary excoriations of the neck and shoulders, consists of equal parts of air slaked lime, boric acid and talcum powder. This may be colored to suit the practitioner. It is cheap and effective.

If a lotion is preferred, there is nothing better than a good saturated solution of sulphate of iron.

L. A. Merillat.

TREATMENT OF OPEN TARSAL JOINT

I should like to know the latest treatment of a severe open tarsal joint.—D. F. P.

Reply by Editor: Naturally the treatment of an open tarsal joint will depend almost altogether upon what portion of the joint is open, the degree of infection and the duration. In recently opened joints, it is always worth while to wash them out thoroughly and painstakingly with ether, in the hope of preventing suppuration. Where the infection is of a few days duration and has already entrenched itself to a point where its elimination is hopeless and where disturbance of the synovial cartilages is inevitable, free drainable anodynes and supporting remedies of a general nature would be indicated.

If the joint opened is the upper or main tarsal joint and suppuration has already ensued, the case is hopeless, and the animal should be destroyed. If only the lower portion of the hock is involved, there is a chance that ankylosis may be produced and almost complete function of the leg restored.

Where treatment is instituted early and before infection has manifested itself, other than by pain and swelling, and the attempt is made to remove it by flushing with ether, further treatment would consist of a careful protection of the joint from further infection and the use of local applications, preferably cold, or probably cold and hot both. Certainly, early in this treatment, cold applications to the parts should be the main standby.

The Army Veterinary Service in Connection with Animals

By Capt. Geo. H. Koon

As previously stated the veterinary service is charged with duties in connection with the animals of the army and with those concerned with the food supplies that are of animal origin. Consideration will first be given to the service with animals and this logically starts with remount purchasing and breeding, headquarters and veterinary service with remount purchasing boards.

Duties at Remount Purchasing and Breeding Headquarters

Brood mares are kept at the three permanent remount depots, Fort Reno, Oklahoma, Fort Robinson, Nebraska, and Front Royal, Virginia, and colts are being raised, but most army animals are purchased.

The United States has been divided into five remount purchasing and breeding districts, each in charge of an officer of the Quartermaster Corps with the required assistants including a veterinary officer. Stallions in charge of selected breeders are scattered throughout these districts and bred to selected mares. The government takes an option upon each colt foaled to purchase when three years old, but is under no obligation to purchase however.

In peace time the officer in charge at a remount purchasing and breeding headquarters ordinarily purchases all animals in his district. In time of war, however, several purchasing boards will work in each district, under the officer in charge. At least one veterinary officer will be a member of each purchasing board, working under the direction of the veterinarian on duty at purchasing and breeding headquarters.

The veterinary service of a remount purchasing and breeding headquarters is charged with duties in connection with the physical examination of animals offered for purchase in the territory assigned to the headquarters, the mallein testing of such animals, the health and sanitary conditions under which they are subsequently handled and shipped, and the breeding operations maintained in said territory.

The senior veterinary officer assigned to a remount purchasing and breeding headquarters is designated as the headquarters veterinarian. Under the officer in charge he supervises and conducts the veterinary service, performing at the headquarters the prescribed duties of a station veterinarian, acting as detachment commander for all veterinary personnel at the headquarters, and keeping the prescribed records and rendering reports and returns. He is furnished with an office at the headquarters and is not assigned to duty with a purchasing board

elsewhere when qualified junior veterinary officers are available. When he is the only veterinary officer assigned to the headquarters (as in peace time), he also performs the duties of a purchasing board veterinarian.

The headquarters veterinarian recommends veterinary personnel under his jurisdiction for assignment to all purchasing boards operating in the territory under the control of the headquarters, and exercises such supervision over their work as may be necessary to insure efficient veterinary service on the boards.

It is the duty of the headquarters veterinarian to see that veterinary officers on duty with purchasing boards are fully qualified in the duties required. Such officers will ordinarily be assigned by War Department orders to the purchasing and breeding headquarters, whence they are distributed to the different boards. Prior to their departure for such duty they will receive such instruction from the headquarters veterinarian as he may consider necessary to thoroughly acquaint them with their professional and technical duties in connection with the veterinary service of purchasing boards and with all regulations which govern, and he will see that they possess the necessary equipment and supplies. Practical demonstration of ability to judge animals for soundness for the military services will be required.

The headquarters veterinarian investigates the sanitary conditions concerned in the purchasing, handling, and transporting of animals in the territory assigned to the headquarters. He familiarizes himself with the nature and extent of the prevailing animal diseases and other local conditions bearing on the health of animals and keeps in close touch with the work of official and civilian sanitary inspection agencies. Special attention is paid to the suitability, cleanliness, and sanitation of yards, stables, and other places in which animals may be assembled before or after inspection for purchase; to the source of such animals with reference to probable exposure to communicable diseases; and to the avoidance of such exposure at any time prior to shipment. He supervises the operation of preventive measures such as mallein and other testing, quarantine, and disinfection.

With the contract method of purchase, corrective sanitary measures may be enforced under the terms of agreement. With the open-market method, sanitary conditions may be controlled through recommendations to the officer in charge, who should be advised to discontinue the purchasing of animals at places where sanitary defects which are a menace to health are not corrected.

Remount Purchasing Board

The veterinary service of a remount purchasing board is responsible for the physical examination of the animals submitted to the board for purchase, their mallein testing, and for supervision of the health and sanitary conditions under which they are handled and shipped by the board. Every animal prior to purchase receives a complete physical examination by a veterinary officer whenever one is available. A like examination is given animals acquired for breeding purposes. The physical examination is in addition to any inspection of the animal made by the purchasing officer.

The senior veterinary officer assigned to a remount purchasing board is designated as the purchasing board veterinarian. Additional veterinary officers as assistants may be assigned to the board as required. The purchasing board veterinarian determines the age and makes a complete physical examination as to soundness and physical condition of each animal submitted to the board, followed by a specific recommendation to the officer in charge as to whether the animal shall be accepted for purchase subject to passing a negative mallein test, or shall be rejected outright.

The ultimate responsibility for the acceptance of an animal for purchase rests with the officer in charge. The veterinary officer in making his examination acts as the professional adviser of the purchasing officer. Having arrived at an opinion as to whether the age, soundness and physical condition of the animal, exclusive of any other factors whatsoever, justify or do not justify its purchase, he recommends accordingly. Having made his recommendation, his further responsibility as regards the acquisition of the animal ceases and the matter of acceptance or rejection is determined entirely by the officer in charge. In order that he may advise most efficiently he must think independently and, exercising his best professional judgment, must arrive at a positive and unbiased decision as to whether the animal is physically fit or unfit for the public service. In all cases of doubt, the interests of the Government are entitled to prior consideration.

Matters of type, conformation, manners, age limits, height, weight, color, etc., are prescribed by the War Department for the guidance of the purchasing officer who is responsible for the interpretation of such purchasing specifications. This distinction between specification

requirements and soundness must be borne in mind. The veterinary officer in making the physical examination considers defective conformation only when manifested by congenital or acquired defects which are distinctly of pathological origin or on which may be predicated a dubious prognosis as to future health or physical efficiency.

Physical Examination of Animals

The veterinary service has prescribed procedure, authorized in Army Regulations, to be followed in the physical examination of animals for purchase, and at intervals during their service from the time of purchase until their final disposal. The purpose of such examination is to protect the interests of the government at time of purchase by insuring that only sound animals are acquired and to obtain information as to their physical condition at all times. The information so obtained is designed to increase the knowledge of the source, breed, and type of animals best suited for army service and to determine the most economical and practical methods of conserving army animals with reference to the nature and duration of the service required of them, their handling during such service, the disabilities to which they are subject, and the manner of their ultimate disposal. The collection and accurate recording of such information renders veterinary science more exact with particular reference to its application to the military service.

The ophthalmic mallein test is applied to each animal to be purchased and, as a result of the interpretation of the test, the purchasing board veterinarian recommends the rejection of any failing to pass a negative test. The ophthalmic mallein test of army animals is authorized only at the time the animal is purchased. The intradermic mallein test is the standard mallein test adopted for general army use. It is designated and recorded by no other name.

A purchasing board veterinarian performs for the area covered and the animals handled by the purchasing board, identical duties as regards the detection and care of sick animals, the investigation of sanitary conditions, the correction of sanitary defects, the operation of preventive measures and the investigation of stock cars, feed and rest stations, and shipping conditions, as are prescribed for the purchasing and breeding headquarters veterinarian with regard to the entire territory assigned to the headquarters. He keeps the officer in charge and the headquarters veterinarian informed of health and sanitary conditions amongst the animals handled by the board and amongst civilian animals with which they may come in contact, and of any matters bearing on the efficiency of the veterinary service, taking advantage of his direct contact with local conditions not always possible to the headquarters veterinarian.

A record is kept of every animal inspected and what recommendations were made. Also of every animal purchased and shipped, reports being rendered on prescribed forms.

This matter of the remount purchasing and breeding headquarters veterinarian and of the remount purchasing board veterinarian has been gone into somewhat in detail because, in the event of war and extensive purchases, the bulk of this work would be performed by veterinary reserve officers.

Service at Remount Depots

Animals have been purchased and are now in the hands of the remount service. No attempt will be made to describe the veterinary service at a remount depot, except to say such service is essentially a station service; that is, the handling of animals upon receipt, sanitary inspections, transferring to other stations (issuing), shipping, etc., are the same as at a regular military station or camp, and the regulations governing the veterinary station service apply also to the service at remount depots.

In all cases of shipment, issue, or turn in, and transfer of animals, the veterinarian at point of origin prepares the prescribed health certificate (Form 101, M. D.) in accordance with instructions, with a view to furnishing to the veterinarian of the receiving station any information of value.

Animals Received at a Station

Immediately upon the arrival at a station of animals from any source whatsoever, and before they have had opportunity to come in contact with other animals, they are given a critical examination by the station veterinarian. In the case of green animals received from a purchasing point, this examination is individual and thorough. In the case of animals acquired without a prior veterinary examination, the station veterinarian makes the complete examination. Animals arriving in cars or other vehicles are unloaded promptly and the sick separated and sent to the hospital, where necessary isolation is provided for cases of communicable disease.

Each animal or lot of animals newly arrived is placed in quarantine under the continuous

observation of the station veterinarian for a period of not less than 21 days, when they are released provided they have shown no signs of communicable disease. In the practical application of this quarantine requirement, allowance is made for special conditions pertaining to the animals as follows:

(1) In the case of newly purchased animals and of animals known or suspected to have been exposed to communicable disease, the quarantine will be absolute. Unloading at a feed and rest station or shelter in a stable en route to the station is considered exposure to communicable disease. An absolute quarantine is one so conducted as to wholly exclude each animal or group of animals from contact with other animals either directly or indirectly by means of feeding places, watering troughs. interchange of attendants or equipment, etc.

(2) In the case of seasoned animals, where there exists no specific reason to suspect exposure to communicable disease, the quarantine may be a working quarantine, maintained in the organization receiving the animals under such restrictions as to their handling and movement within the station as will secure the largest practicable degree of freedom from contact with other animals.

(3) If the animals received were undergoing a working quarantine at the place of issue, and the quarantine was not broken enroute, it may be continued at the new station for a period sufficient to make a total of 21 days from its beginning at the old station. Unloading or sheltering at a feed or rest station or stable enroute constitutes breaking quarantine, in which event the entire period of 21 days quarantine is enforced at the new station.

The station veterinarian recommends the nature and extent of the foregoing quarantine measures which he considers appropriate in each case, with such modifications as may be indicated from time to time, and when the animals shall be released. As approved by the commanding officer, he supervises the operation of all quarantines, keeping the animals under observation during the entire period. It is especially important that he make a daily personal inspection of animals in quarantine in order that he may be cognizant of all facts concerning the operation of the quarantine and that there may be no delay in detecting sick animals and separating them from the well. Animals of the type properly placed in a working quarantine usually present the minimum of danger to the other animals. Permitting them to work may imply a degree of contact impossible to avoid without complete isolation, which is unnecessary. Restrictions imposed by a working quarantine should be dictated by practical rather than theoretical considerations in order to obtain the most satisfactory results. The veterinary officer should base his recommendations on a careful study of all circumstances bearing on each case or class of cases. Close observation of animals in working quarantine is enjoined. The development of a case of communicable disease in a group of quarantined animals makes them all contacts and requires that the quarantine period be extended, depending on the special conditions present.

Careful attention is given to animals received at a station with special reference to their source, the prevailing diseases thereat, the methods of handling and conditions encountered enroute, their physical condition on arrival, and the manner in which mallein testing and other prescribed requirements have been met.

Detection and Care of Disabled Animals

It is necessary that a disabled animal receive proper professional attendance at the earliest practicable moment following the discovery of the disability, irrespective of its nature or severity. Station veterinarians utilize veterinary sick call, routine daily inspections, and every other available occasion for the prompt detection of animal disabilities. They initiate, without delay, the necessary action to secure the separation of the sick from the well, the segregation of patients in hospital or other suitable place and their retention therein until recovered, the adoption of appropriate measures of management and restraint, and the application of such curative procedures as may be considered advisable.

Station veterinarians determine when an animal is to be placed on sick report and when it is to be discharged therefrom. Animals on sick report are classified as "Stables" or "Hospital." Stables cases are those of minor conditions which can be treated advantageously within the organization to which they pertain. Hospital cases are those for which hospital treatment is considered desirable. When a veterinary station hospital or dispensary is available, hospital cases will be admitted thereto. In the absence of hospital accommodations, they will be sheltered in a stable or part thereof set aside for the purpose in the organization. The term "Stables" or "Hospital," therefore, refers to the degree of disability of an animal rather than to the place of treatment.

All animals while sick in hospital are under control of the station veterinarian. Animals sick in stables are under the control of the organization commander and under the supervision of the veterinarian. The routine daily care of stables cases is furnished by the personnel of the organization to which such cases belong. Hospital cases, wherever sheltered, are wholly cared for by veterinary personnel insofar as such personnel is available. In the absence of adequate personnel, the station veterinarian should recommend to the commanding officer the detail of other personnel to report to him for this purpose.

Register and Report of Sick and Wounded Animals

A full record of each sick and wounded animal at every military post or station and separate command which is attended by a veterinary officer is made on what is known as a register card (Form 115, M. D.). These cards collectively constitute the register of patients, and a case carded on them is said to be on the register.

A register card is made for every animal admitted to hospital for treatment; for every authorized private mount and public animal with the command which, though not admitted to the hospital, is excused on account of sickness or injury from the performance of its military duty or some part thereof (stables cases); for every animal of the command which, though not excused from duty, is prescribed for or treated, or placed under observation with a view to treatment, or in the case of a public animal to inspection for condemnation for physical disability if the disability of any such animal is of such character as to have a probable bearing on its subsequent veterinary history (in other words, pathological conditions); for every authorized private mount or public animal, not currently on the register, which dies or is destroyed while in the service; for every public animal, not currently on the register, sold or destroyed for physical disability subsequent to the action of an inspecting officer; for every authorized private mount and public animal with the command, not currently on the register, which is sent to another station or command for observation and treatment; for every authorized private mount and public animal transferred sick or injured from another command; and for every public mare, not currently on the register, delivered of a foal.

Register cards are made day by day as the cases are admitted. They are kept in two files, the current file and the permanent file; the current file consisting of register cards of uncompleted cases arranged in the serial order of their register numbers and the permanent file comprising all the register cards of completed cases filed in the serial order of their register numbers.

At the end of each month a copy of the register card of each case completed during the month, called the report card, is forwarded to the Surgeon General's Office. A copy of the register card of each case still on sick report at the end of the month, and which has been on sick report more than a month, called the remaining card, is also sent to the Surgeon General's Office. Not more than one remaining card is sent for each case from any one hospital regardless of the time carried on sick report. When such cases are completed a final report card is forwarded with the report for the month during which it is completed.

The register cards remain at the station, constituting a part of the veterinary history thereof. The report cards are exact copies of the register cards, and when sent to the Surgeon General accompany what is known as the report sheet (Form 102, M. D.).

There are 21 spaces on the register cards (Form 115, M. D.) completely identifying the animal, showing date of admission, whether a "Stables" or "Hospital" case, diagnosis, causes, complications, last mallein test, disposition, name of hospital, days sick and name of veterinarian.

The report sheet (Form 102, M. D.) shows station from which sent, organizations composing the command, animal strength by classes, mean human strength, statistics of the monthly glanders tests, autopsy examinations and results, the number of completed and remaining report cards accompanying the report sheet, and the signature of the veterinarian. A duplicate of the report sheet is retained with the veterinary records of the station or command.

The report of sick and wounded animals is required monthly from every military station and separate command which is attended by a veterinary officer or to which veterinary enlisted personnel is assigned. At stations to which veterinary enlisted personnel are assigned without a veterinary officer the surgeon renders the reports. The report is forwarded before the fifth day of the next succeeding month.

All diseases and injuries are recorded on the register of sick and wounded animals in accordance with a veterinary diagnostic nomenclature published in Army Regulations. Certain terms included in former diagnostic tables or in common use by veterinarians do not appear in the diagnostic terms, but the proper synonyms of such of them as are deemed necessary are shown. The Army regulation pamphlet showing diagnostic terms also includes a list of such terms which will not be recorded. Each such discarded term is followed by its approved synonym or synonyms which are included in the diagnostic terms.

Surgical operations are likewise recorded using terms adopted as standard for the army veterinary service.

The need of uniformity in localizing surface lesions of every nature was apparent and the lack of a standard veterinary regional nomenclature made it necessary that such a nomenclature be adopted for army use. The various surface regions for use in preparing register cards are defined and described in Army Regulations. (To be continued)

ADDITIONAL RESERVE OFFICERS

Captains

Balthaser, Harry Becker
2060 N. 62nd St., Philadelphia, Pa.

Farmer, Clarence Roy
212 N. 8th St., Keokuk, Iowa.

Gaston, Wendell Nelson
Peterson, Iowa.

Hunter, Wade George
830 Mulberry St., Mt. Vernon, Ind.

Jones, Frank Burdette
P. O. Box 59, Jefferson City, Mo.

Morrow, Albert Caine
325 S. Rife St., Dillon, Mont.

Nichols, Herbert Cline
506 Fort King Ave., Ocala, Florida.

Tweed, Peter Thomas
471 Park St., Lebanon, Oregon.

1st Lieutenants

Kucher, Paul Cox
829 W. Jefferson St., Ft. Wayne, Ind.

Nash, John G. C.
201 A Avenue, West, Oskaloosa, Iowa.

Nelson, Marvin Lothard
702 East Lake Ave., Ladysmith, Wis.

2nd Lieutenants

Chappell, Robert Forrest
Navasota, Texas.

Hindshaw, Wm. Russell
Dept. of Bacteriology, K. S. A. C.
Manhattan, Kan.

Moody, Robert Earl
1138 Walnut St., Gadsden, Ala.

Meads, Frederick F.
P. O. Box 477, Cherokee, Oklahoma.

Moore, Eugene James
Lenoir, N. C.

Rothgarn, Charles Wm.
Pine River, Minnesota.

Smith, Ivan
3906 S. 24th St., Omaha, Nebraska.

Stiles, Floyd Elton
216 W. Van Buren St., Battle Creek, Mich.

Vilott, William Trevor
215 Esch Bldg., Stock Yards, Oklahoma City, Oklahoma.

CHANGES IN STATUS OF RESERVE OFFICERS

Assignments

Turner, Amos Alfred, 2nd Lt., Vet-ORC, 119 S. Monroe Street, Streator, Illinois, assigned to Veterinary Evacuation Hospital No. 6, in capacity of Assistant Evacuation Officer, February 9, 1924.

Promotions

Baumgartner, Clyde Roy, Vet-ORC, Spencerville, Indiana, promoted from 1st Lieutenant to Captain.

Ragsdale, Howard LeRoy, Vet-ORC, Shelbina, Missouri, promoted from 1st Lieutenant to Captain.

Bibens, David Harkey, Vet-ORC, Kincaid, Kansas, promoted from 2nd Lieutenant to 1st Lieutenant.

McKitterick, James Alexander, Jr., Vet-ORC, Greenwood, Missouri, promoted from 2nd Lieutenant to 1st Lieutenant.

CHANGES RELATIVE TO VETERINARY OFFICERS, REGULAR ARMY

Lt. Colonel James H. Uri, reported for duty at 1st Corps Area headquarters, February 27, 1924, from leave subsequent to return from Panama.

1st Lieutenant Claude F. Cox, relieved from San Francisco General Intermediate Depot and sailed from San Francisco, February 20, 1924, en route to Philippine Department for duty.

1st Lieutenant Patrick H. Hudgins, relieved from duty at Seattle General Intermediate Depot and directed to report to San Francisco General Intermediate Depot for duty, February 25, 1924.

1st Lieutenant John R. Ludwigs, relieved from duty at Vancouver Barracks, Washington, and directed to report to Seattle Quartermaster Intermediate Depot for duty, February 25, 1924.